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Chymotrypsin Treatment of Chronic Infections

Diseases of Cattle Caused by Clostridia

Spray Application for Treatment of Ringworm in Cattle

Anthrax in Livestock During 1953

Sedative Restraint in the Dog

Use of Hydrocortisone in Small Animals

Hyaluronidase in Management of Canine Urolithiasis

New Oral Anthelmintic for Canine Whipworms

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Chymotrypsin Treatment Of Chronic Infections In Animals

L. E. JOHNSON, D.V.M., M.S.* and L. C. FERGUSON, D.V.M., Ph.D.**

A number of clinical conditions recognized in domestic animals do not respond readily to surgical or chemical therapy. The report by Limber *et al.*[1] that human tuberculous empyema responded favorably to treatment by crystalline trypsin, laid the groundwork for further investigation in proteolytic enzyme therapy. Chymotrypsin was selected, since certain information supplied by Armour Veterinary Laboratories suggested it may be the proteolytic enzyme of choice for veterinary use.

Chymotrypsin is a highly purified proteolytic enzyme prepared from the mammalian pancreas. It is extremely stable in crystalline form, but rapidly autolyzes in solution at room temperatures. Although it is active in a range from pH 5 to 8, greatest proteolysis is demonstrated about pH 7.1 which can be obtained with a suitable substrate such as Sorensen's solution.

Enzymatic treatment of disease associated with suppuration or necrosis is likely to rival the forward progress of therapeutics heralded by the appearance of the antibiotics. The advantage of trypsin or chymotrypsin therapy is that dead tissue, purulent exudate, fibrin and mucin are broken down to polypeptides with no effect on normal, healthy, living cells or tissue. *A lesion filled with heavy, purulent material such as seen in mastitis, metritis, abscesses, etc., is rapidly liquefied, resulting in rapid drainage of the lesion with consequent removal of the medium for the growth of bacteria.*

No attempt was made to restrict the therapy to chymotrypsin in the cases reported. Indeed, it is sound practice to administer antibiotic or hormonal therapy (P.O.P.® in bovine mastitis) following use of the enzyme.

Chymotrypsin treatment is indicated in those chronic lesions where there is excessive exudate and necrotic tissue with little or no opportunity for drainage. Although there appears to be no bactericidal activity, *per se*, inherent in the enzyme, fluid drained from a case of tuberculous empyema treated by crystalline trypsin, was found to be sterile on bacteriological examination. Chymotrypsin also may be used in place of surgical debridement of a sloughing area with the expectation of decreased traumatic damage, early appearance of healthy granulation tissue and, consequently, faster healing.

The enzyme may be used topically or injected into infected fistulous tracts or other cavities. It may be applied in solution, in the form of fast dissolving gelatin capsules, or the dry crystals may be sprinkled over the affected area. The dosage used depends entirely upon the extent of the lesion and the amount of exudate and necrotic material to be

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We wish to thank Armour Laboratories for supplying the chymotrypsin used in this clinical investigation.

[1]The Armour Veterinary Laboratories, Chicago, Ill.

digested. No untoward effects have been noticed with repeat dosages.

In some cases treated, there was a noticeable rise in body temperature*. This febrile response appeared to be directly proportional to the amount of necrotic tissue present in the lesion. It is assumed that this reaction results from absorption of the liquefied toxic material. Antihistaminics, given in conservative quantities, failed to reduce the body temperature appreciably. After initial application of the enzyme, subsequent administration produced little or no systemic effect.

The following case reports have been selected to illustrate the type of clinical patient in which chymotrypsin treatment might be expected to produce the best results.

Case 1. Suppurative Pericarditis

A five-year-old, 1,200-lb. Holstein cow which had calved in January, suddenly refused to eat and milk production dropped from 64 to 18 lb. by April. Previous record of illness occurred at calving at which time this cow was treated for postpartum paresis followed by uneventful recovery.

On April 10, 1951, the animal was presented at the Ohio State Veterinary Clinic with a temperature of 101.8 F., pulse 78 and respirations 60. Chest sounds were normal,

Fig. 1. Note enlargement of the hock joint. Partial flexion of the leg and the several fistulous openings over the surface of the joint.

Fig. 2. Roentgenogram of suppurative arthritis case shown in figure 1. Note the exostosis and erosion of the malleoli of the tibia.

heart sound slightly muffled, rumen activity poor, and the electronic metal detector test proved positive.

Rumenotomy was performed on the following day and a five-inch length of wire which was penetrating the anterior wall of the reticulum, and presumably the diaphragm, was removed. Procaine penicillin (3,000,000 units) was given in one dose postoperatively. The convalescent period was uneventful except for an undulating temperature which ranged from 100.8 to 103.6 F. on the ninth day. The heart sounds during this period grew progressively more muffled until the tenth day, when they no longer could be heard. On the tenth postoperative day the temperature rose to 105.4 F. Previous dose rate of procaine penicillin was repeated daily for the next three days with some improvement in the fever.

On the 12th day, one of us (Johnson) resected a portion of the fifth rib in the left chest, and fixed a three-way rubber catheter into the pericardial sac. A diagnosis of pericarditis was confirmed at this time. The chest was closed and the heart sac contents drained through the catheter, which was allowed to remain in position for 21 days. The day following the rib resection 80,000 AU* of chymotrypsin were dissolved in 200 cc. Sorensen's diluent and infused directly into the pericardial sac. Hourly records kept of the body temperature revealed that it reached a peak of 107.3 F. within a 24-hour period. The sac was drained and a similar dosage of chymotrypsin again was

*Armour Units.

infused. The temperature remained elevated, but was lower than for the previous day. On the third day, the enzyme therapy was discontinued until normal body temperatures were recorded on the fifth day. During this time, the heart sac was drained daily of approximately 1,000 cc. of fluid, after which saline and penicillin were infused. Subsequent infusions of chymotrypsin were given every other day for two weeks with no effect on the body temperature (a total of nine adminstrations of chymotrypsin, 720,000 AU in 21 days).

The animal was dismissed from the clinic 30 days following the operation and was sold to a meat packer three months later for $300.

Case 2. Suppurative Arthritis in a Mare

On February 4, 1951, a five-year-old Palomino mare was entered at the clinic with a large swelling on the right hock. The owner stated that the animal had been kicked by another horse while on pasture November 22, 1950. The mare refused to bear weight on the affected leg following the injury. The owner had treated the hock daily with hot packs and various liniments and ointments. Two weeks following the accident the joint enlarged to twice the normal size and developed several fistulous tracts, (figure 1). During the next two months two veterinarians treated the wound topically and administered antibiotics.

Upon examination at the clinic, the animal was noted to be well nourished in spite of obvious pain and inability to use the leg. The musculature of the right hip and leg were extremely atrophic, and the leg was held in constant flexion. Radiological examination confirmed a tentative diagnosis of suppurative arthritis. The *x*-ray (fig. 2) revealed an exostosis and erosion of the joint surfaces.

Sulfonamides, penicillin, and streptomycin were given for three weeks without favorable results. Bacteriologic examination on the 25th day revealed the presence of hemolytic streptococci and staphylococci. On the 26th day, 80,000 AU chymotrypsin were injected into the joint; this was repeated daily for the next five days. There was no appreciable elevation of body temperature during this period. Pain was controlled with sodium salicylate, acetylsalicylic acid and chloral hydrate. After three days of treatment with chymotrypsin, the joint became less painful and the leg was extended, allowing the foot to touch the floor. Granulation tissue appeared around the fistulous openings, and some of the fistulous tracts healed. Five days following the last injection of the enzyme, the remaining tracts were healed, however, the animal refused to bear weight on the leg.

One month after discharge, the owner reported the mare was on pasture and capable of bearing weight on the leg. A further report three months later indicated that all tenderness was absent, and aside from an enlarged joint and a slight limp, the animal was doing well.

Fig. 3. Note the massive enlargement of the hock.

Case 3. Purulent Sinusitis

A four-year-old Jersey cow was presented to the Veterinary Clinic for observation and examination, suffering from a chronic digestive disturbance. A rumenotomy had been performed a year previously, and foreign bodies were removed from the reticulum. The animal had improved temporarily but continued to show inappetence and lowered milk production. Two weeks before admission the cow was dehorned and three days later had become depressed and refused to eat.

Clinical examination revealed a purulent sinusitis involving the left frontal sinus. The scar tissue on the cornual process was removed and the sinus drained through this opening. Sulfapyridine sodium and sulfa-urea powder were dusted into the sinus on two successive days. On the third day it was flushed with 3% hydrogen peroxide and the sulfapyridine and sulfa-urea powder again used. The exudation continued both from the nose and

the artificial opening. On the fifth day, 250,000 AU crystalline chymotrypsin in 25 cc. Sorensen's diluent were introduced through the cornual opening into the sinus. Eight hours later the body temperature rose from 101.2 to 103 F., and therapy was discontinued because of the danger of a continued systemic reaction which might cause abortion of an eight-month fetus. At this time the sinus was drained by tilting the head; the exudate was thin, fluid in consistency, and free of gross particles.

During the following days there was no evidence of nasal exudate. The cow remained bright and active and the temperature was normal. Four days after introduction of the chymotrypsin 1,000,000 units of penicillin were infused into the sinus. The exudate decreased in quantity and appeared clear. Within five days all fluid had disappeared.

The cow continued to reveal intermitttent attacks of rumen atony and variable appetite, but within two weeks after admission, the sinusitis had improved to such a point that the animal was discharged.

Case 4. Chronic Frontal Sinusitis

A three-year-old Holstein cow was presented at the clinic suffering from a chronic frontal sinusitis. She had been dehorned about one year previously. The owner stated there had been considerable discharge from the "stump" during the healing period. The animal recently had begun to show signs of pain.

On examination, the cow exhibited a foul-smelling, suppurative exudate from the base of the right horn. There was a slight bulge in the sinus roof in the region of the right eye, but the general condition of the animal was judged to be fair. The temperature was normal.

The sinus was opened at the horn scab and the anterior portion of the frontal region examined through trephine openings. The anterior sinus did not appear to be involved and was closed immediately. The posterior portion of the sinus was filled with a heavy, purulent exudate, which was removed by tilting the head upward and to the side. Chymotrypsin (500,000 AU) in 60 cc. of diluent were placed in the sinus. Six hours later the sinus was drained. The material in the sinus had resolved from a heavy, grey, flaky exudate to a thin, sanguinous fluid.

Chymotrypsin treatment was repeated on the following day. On the third day, the exudate was liquid in consistency, light brown in color and possessed a foul odor. Crystalline penicillin (100,000 units) was placed in the sinus during the next two days, and was followed during the next week with applications of sulfanilimide and sulfa-urea powder. At the end of two weeks, the surgical wounds were starting to heal and the small amount of exudate was mucoid in character with occasional flakes of purulent material. Six weeks after surgery, the animal was symptom-free and was discharged.

Case 5. Fracture with Bone Necrosis

An aged Holstein-Friesian bull weighing approximately 1,800 lb. was presented to the Veterinary Clinic with the following history: "About 2½ months ago a cut was noticed over the left hock joint". The owner treated the animal locally and healing appeared to be satisfactory until about three weeks before presentation. The hock joint had become swollen and the animal appeared lame. Continued local treatment, plus penicillin therapy, produced no improvement.

On examination, the bull refused to bear weight on the affected leg. Edema extended from the hock to the foot and a fistulous tract was noted on the medial surface of the hock, (figure 3.) The temperature was 103.6 F.

Sixty grams of streptomycin were given during the first three days with no improvement in the general condition. The body temperature ranged a little above normal—from 102.8 to 104 F. Exudate from the fistula was examined bacteriologically on the fourth day and was found to contain *Corynebacterium pyogenes.*

Chymotrypsin therapy was started on the fourth day. Eighty thousand AU were dissolved in 10 cc. of Sorensen's diluent and injected into the fistulous tract. This treatment was repeated twice daily for four days. During this time the exudate became less viscous but remained sanguinous. On the seventh day of treatment 800 cc. of sulfatose were given intravenously, and 120 gm. of sulfapyridine administered orally on each of the following three days. On the eighth and ninth days, 250,000 AU of chymotrypsin in 50 cc. of diluent were introduced into the lesion on each of six separate occasions.

Little response was elicited and the animal gradually became more depressed, the body temperature decreased slightly and the respiratory rate increased. Death occurred on the tenth day following admission. Autopsy revealed extensive involvement of the left hock joint. The medial malleolus of the tibia was fractured, probably from the original injury. There was necrosis of the bony tissue involving

all the structures in the articulation, and fistulous tracts extended from the articulation to the distal extremity of the leg. Fistulas also extended upward along the intramuscular septa of both the extensor and flexor groups of muscles of the leg. Exudate from this area was positive for *Cory. pyogenes.*

The extent of the lesion in this animal, as well as the small surface opening, probably was responsible for failure of the medication to reach the affected parts. In retrospect, more radical treatment may have been life-saving. Enlargement of the fistula would have established drainage and permitted application of chymotrypsin and bactericidal agents to the entire affected area.

Case 6. Foot Canker

A three-year-old Thoroughbred stallion was presented at the Clinic on November 10, 1952. "For several months," the owner complained, "the sole of the right foot had been disappearing."

Inspection of the affected foot revealed a total loss of the nonsensitive frog and 95% loss of the horny sole. The sensitive portion of the frog and sole was completely covered by finger-like strands of necrotic tissue and exudate (figure 4). Even slight pressure with a tongue blade on the sole of the foot was poorly tolerated due to extreme sensitivity. The wall of the foot appeared to be normal, and extended beyond the diseased sole for about one centimenter. This extension of the insensitive wall made it possible for the patient to bear weight on the affected leg.

Methods of treatment, complications and possibilities of success were considered in detail. Our initial choice of methods lay in complete surgical debridement, *x*-ray therapy, applications of caustics or the use of chymotrypsin, heretofore untried in such a condition. We were certain at this time that the action of chymotrypsin would not adversely affect living tissue. We also realized that employment of surgery or caustics would remove certain amounts of normal, healthy tissue, thus lengthening the convalescent period.

Chymotrypsin therapy, therefore, was begun with the daily applications of 400,000 AU in 30 cc. of Sorensen's diluent. For purposes of assessing the effectiveness of this agent, only one-half of the foot was treated, (fig. 5). In 24 hours, digestion of necrotic material over the treated area had reached a depth of from one-half to one centimeter. In 48 hours digestion was nearly complete, with healthy, pink granulation tissue visible over most of the treated area. Delineation of this portion of the foot from the untreated was quite marked, (fig. 5), and corresponded exactly to the area treated by the enzyme solution.

Fig. 4. The foot before treatment.

Fig. 5. Following treatment. The line of demarcation between treated and untreated portions of the foot is clearly apparent.

Fig. 6. Appearance of fistulous withers before treatment.

Fig. 7. Appearance of withers after ten days of treatment and two weeks of hospitalization. Note the scar resulting from previous surgical intervention and healed fistulous tract.

The untreated half of the foot then was subjected to chymotrypsin therapy and showed identical results. The entire foot was kept lightly bandaged to prevent soiling and to minimize the possibility of infection.

For purposes of continuing treatment, the owner was supplied with trypsin 1:250 (Difco) for dusting the affected foot. One month following discharge the owner reported the foot in about the same condition with no apparent provisional horn over the sole.

It appears in this case the chymotrypsin was an effective agent in controlling the malignant-like growth so characteristically found in foot canker.

Case 7. Fistulous Withers

On December 3, 1951, a two-year-old filly was presented for treatment of fistulous withers. A swelling had appeared over the withers about one year previously, apparently due to a bruise. The animal was in the habit of eating through a cow stanchion which interferred with the neck and withers. Various home remedies had been tried in addition to professional services, without success. The swelling persisted along with some enlargement until three weeks before hospitalization when "it broke."

On examination at the Clinic, the animal was found to have multiple fistulous tracts on both sides of the withers, (fig. 6). The shoulders and legs showed evidence of long-standing, excessive drainage. There was marked alopecia over the drainage areas, and a superfical dermatitis from prolonged contact with the purulent exudate.

Chymotrypsin therapy was begun immediately with the application of 200,000 AU twice daily to each side. This schedule was repeated for four days, followed by a two-week period with no treatment of any kind. The same dosage was repeated for another four-day period followed by no further treatment. On the tenth day following the last series, no discharge was seen, the tracts appeared completely healed over, and hair was beginning to grow over the affected area, (fig. 7). The horse was kept for three more days and discharged as cured. Two years later the owner stated there had been no recurrence of the condition.

Discussion

It has proved difficult in the past to treat adequately certain diseases characterized by widespread destruction of tissue with the appearance of inflammatory exudate. Maggot therapy has been used to debride various lesions, but its use is limited to the cleaning of visible areas of the skin and superficial tissue. Surgical currettment, to be complete, always must involve removal of some living tissue.

(Continued on page 297)

Some Diseases Of Cattle Caused By Clostridia: Their Diagnosis And Treatment

A. H. QUIN, D.V.M., Kansas City, Missouri

Diseases caused by organisms of the genus Clostridium are of foremost importance in the cattle producing areas of the United States. Before the advent of vaccines for prophylaxis, losses due to several organisms classified as Clostridia, were significant. Preventive agents (biological) now available have taken into account new findings involving species previously regarded as of little consequence.

In the accompanying article, the author outlines practical recommendations for treatment and management of this group of diseases. He emphasizes the advantages of accurate diagnosis by laboratory means for differentiation. He also reports personal experiences in handling these infections in a number of herds.

IN all countries of the world, diseases of cattle caused by spore-forming microorganisms of the genus Clostridium rank as important and costly problems. Many of these diseases follow definite geographic patterns of distribution. Likewise, the occurrence pattern of some by regions may be carried on down to smaller areas and even to individual farms. For example, blackleg of cattle is indigenous and occurs perennially in south portions of Iowa, whereas, the disease is quite rare, or apparently nonexistent, in several of the northern or northeastern counties of that state.

In Louisiana, *Clostridium hemolyticum* red water, before the time vaccine was available, caused annual losses ranging from 10 to 20% on plantations around Thibodeaux and Lafayette, while other plantations in the same district never reported losses, and to this day do not vaccinate cattle against this disease.

In the Platte river valley region of Nebraska cattle losses from *Clostridium septicum*, the organism of malignant edema, are common, while on open range north of the valley and on into the Dakotas, blackleg "breaks" due to *Cl. septicum* infection are rarely reported.

Shifts in the agricultural or husbandry methods of given regions may also influence the occurrence of clostridial diseases. For example, red water in Louisiana formerly was most common in cattle ranging the inaccessable swamps, or where they had access to stagnant and polluted water of bayous. But now, to quote Dr. Louis Leonpacher of Lafayette[1]: "The enormous war-inspired increase in rice production has driven cattle into new pastures with no provision for adequate water supply. And, the additional draining away of water for rice irrigation has led the cattle into filthy puddles which, under normal water conditions, they would have refrained to drink. The consequence is a considerable increase in red water in spots where it was never before known to exist. This is to say that it was not carried there but is simply 'newly found'."

Feed Lot Red Water

There appears, also, to be quite sound evidence that cattle grazing red water range can break with the disease weeks or even months after shipment to feed lots in red-water-free areas. The following is a case in point:

In the spring of 1950, 200 head of New Mexico steers were purchased at a Kansas auction and put on pasture on a Missouri farm for the summer. That autumn they were placed in the feed lot and gained well on a ration of whole corn, ensilage, cob meal, soy bean oil meal, salt, and legume hay.

About mid-November, Dr. M. D. Conrad of Plattsburg, Mo., was called to the farm because of sudden and unexpected death of two steers. There was no history of previous illness. Four other steers had been found dead in the morning over the previous three-week period. The four carcasses had been fed to hogs and, as no sickness appeared in the hogs, anthrax was eliminated as the cause of deaths.

Examination of the dead steers revealed blood at the nose and anus as well as edematous, slightly crepitant swelling of the lumbar region. Because history of previous vaccination was rather hazy, all remaining animals were vaccinated with chauvei-septicus bacterin.

One slow steer carried a temperature of 106 F. with shallow, fast respiration, extreme gauntness, and anemic condition of the conjunctivae

and passage of clotted blood from the rectum. This steer was given 3,000,000 units of slow penicillin intramuscularly and a full dose of sodium sulfamethazine intravenously.

Death occurred about eight hours later and negative findings were reported on a jugular blood sample sent to the diagnostic laboratory.

Three weeks later, two more steers were found dead. The necropsy findings included: Extensive, subcutaneous hemorrhages with petechiae and ecchymotic hemorrhages of all visceral tissues. Particularly prominent hemorrhages of the parietal peritoneum and mesentery were noted. A large quantity of hemoglobin-stained fluid was found in the body cavities. The bladder was filled with port-wine colored urine. The gall bladder was distended with dark greenish-yellow bile. The liver appeared darker than normal with a single, large, necrotic spot and multiple light colored small infarcts. The spleen was somewhat enlarged,

Fig. 1. Liver infarct typical of Clostridium hemolyticum infection of cattle.

but with extensive hemorrhagic enteritis and colitis with shreds of sloughed mucous membrane and masses of clotted blood in the lumen. Only moderate to slight icterus was eviden in the two carcasses.

Liver smears of the necrotic liver lesion revealed great numbers of Gram-positive rods with predominantly subterminal spores. Histological and cultural studies by the B.A.I. laboratory in Washington confirmed a tentative diagnosis of *Cl. hemolyticum* red water. All remaining steers were vaccinated with red water bacterin with only two postvaccination deaths. The steers were marketed without further losses about six months later.

Stale Pond Red Water

In the Midwest almost every farm or ranch has one or more small ponds usually located in cattle pastures. During late summer droughts, when the water level is low, these ponds become apparent incubators for parasite eggs, coccidia, and a variety of other cattle pathogens. One of these pond syndromes is an acute fatal condition with accompanying hemoglobinuria. Yearlings, calves and young adult cattle appear especially susceptible. The symptoms are about the same as those noted in hemolyticum red water, with or without bloody diarrhea. The red urine contains no entire red blood cells and the normal red blood count of 8,000,000 to 10,000,000 drops to as low as 2,000,000 preceding death.

On necropsy these cases show mass petechial and ecchymotic hemorrhages of the viscera with moderate to marked icterus. There is not so great a tendency toward bloody imbibition of the parietal pleura as in true red water and we never have noted the single, large liver infarct so typical of hemolyticum infection. Instead, the liver is a yellow to ochra color with a great number of tiny necrotic foci diffused through the parenchyma. The kidneys are heavily petechiated, the spleens rarely enlarged, and the enteritis not usually as profound in the acute cases as in true red water.

In these late summer cases with history of access to stale pond water, vaccination with *Cl. hemolyticum* bacterin has not stopped the losses unless cattle also are kept away from ponds.

Limited cultural studies reveal a sporulating rod which meets the postulates of *Cl. perfringens* with predominant characteristics of perfringens type A. This type of summer hemoglobinuria is now further complicated by reports that Leptospira have been isolated from typical cases. Thus, we are in the rather unhappy state of not knowing whether Clostridium, Leptospira or a combination of both are the specific etiological factors.

Perfringens Red Water

Dr. A. L. Tietze[3] of Bakersfield, California, reports occurrence of perfringens type red water in 18 herds during 1950 and 1951. Morbidity ranged from 50 to 80% with a mortality of 5 to 10%.

According to Doctor Tietze, affected animals became stiff and unsteady in the rear quarters, which symptom was followed by voiding red urine. Anemia and icterus were noted at autopsy. The temperature range was around 106 F. and the duration of sickness in fatal cases not over 72 hours. The kidneys and heart muscles were heavily petechiated and the bladder filled with red urine. Histological sections of the icteric, granular livers revealed coagulation necrosis around the central veins. Sections

of the kidneys showed only blood pigment casts in the tubules. All sections, as well as cultures, were negative for Leptospira.

According to the findings of the San Gabriel Diagnostic Laboratory, the organism isolated from the Bakersfield cases was identified as *Cl. perfringens* type A. It is also interesting to note that Doctor Tietze found favorable response to type D perfringens antitoxin even though the causative organism was identified as type A.

Type C Perfringens of Calves

Within the past year Griner[4] and his associates at Colorado State College have reported on a new disease of baby Hereford calves on open range.

Apparently analogous to pulpy kidney disease of lambs, the condition strikes when these strong nursing, and otherwise healthy calves, are from two to ten days of age and on heavy milking dams. Most of these calves are simply found dead and, if seen, symptoms such as colicky pain, straining, blood flecked stools and opisthotonos cover no more than two to four hours.

The predominant postmortem finding in these calves is a profound, desquamating enteritis of the jejunum and ileum with much seepage of free blood into the gut. The heart and thymus gland are hemorrhagic, and scattered hemorrhages are noted on other visceral organs. The condition has been reproduced experimentally in a dairy calf by feeding whole culture and corn meal. This clostridial syndrome of baby calves is definitely proved to be due to type C *Cl. perfringens*; so far as I know, the first type C perfringens that has been incriminated in cattle disease here in the United States.

Experimental work by Griner, *et al.*, is continuing and the possibility of developing an effective antiserum and bacterin appear promising.

False Blackleg

Any paper on clostridial diseases of cattle must include a consideration of what may be designated as "false blackleg" for want of a better name. It long has been established that the *Cl. septicum* of malignant edema is responsible for many breaks in blackleg vaccinated cattle. There may be veterinarians who can differentiate malignant edema from true blackleg in previously vaccinated cattle but I am not one of them. Differential diagnosis usually is possible by stains of impression smears of the livers of guinea pigs inoculated with suspected tissue fluid. *Cl. chauvei* appears as single or paired organism while the malignant edema organism appears in medium to long filaments or chains.

Fig. 2. Vacutainer culture bottle (B-D) for transporting blood samples to the laboratory. Each bottle contains 50 cc. of sterile tryptcase soy broth under CO_2 vacuum. Packed with the bottle is a sterile tube equipped with needles for drawing a quantity of blood from patient directly to bottle of culture media. The media is suitable for growth of many aerobic and anerobic organisms including those of the genus Clostridium, Pasteurella, Brucella, Corynebacterium, and others. Organisms which do not grow are maintained viable until transfer can be made to favorable growth media.

These bottles are of value in that possibility of contamination of samples is minimized. Specific results, particularly in the case of positive cases, are often available earlier than with routine sampling methods. They are safer in sampling cases of suspected transmissible disease.

For suspected anerobic organisms, bottle is withdrawn from puncture needle before needle is drawn from the vein. For suspected aerobic cultures, proceed as above, then allow oxygen to replace CO_2 by placing a sterile cotton pledget over needle puncturing diaphragm of bottle stopper.

The lesson learned after going through one or more blackleg breaks is that it is always preferable to vaccinate with combined chauvei-septicus bacterin rather than with monovalent blackleg bacterin.

In consideration of the blackleg break problem we must keep in mind that *Cl. novyi*, the spore-former responsible for black disease in sheep, also can be implicated in so-called false blackleg. Two interesting outbreaks of *Cl.*

novyi infection were cited by Byrne and Armstrong of Ontario in 1948. These occurred in cold, winter weather, and in one the loss was 22 head of 47. None of the classic symptoms, that is, extensive crepitant muscle swellings, were found. Temperatures ranged around 106 F. with slight swelling of the throat latch. The usual hemorrhagic picture was noted on autopsy with marked hemorrhages and light ulceration of the abomasal mucosa. The intestines were inflamed deeply with necrosis of the mucosa and free hemorrhage into the lumen.

Vaccination of remaining animals in one herd with *C. novyi* bacterin stopped further losses.

An Alabama Outbreak

Another interesting outbreak of false blackleg occurred in the Hale County, Alabama practice of Dr. Joseph Sledge.

This large herd consists of 450 brood cows, 200 yearling and two-year-old heifers and the young calf crop. All calves had been vaccinated with "straight" blackleg bacterin. Four head died and the remaining 100 heifers, ten to 16 months of age were revaccinated with chauvei-septicus bacterin. The diagnostic laboratory reported isolation of *Cl. septicum* and, as losses continued, this group was revaccinated the second time with a 10 cc. dose of chauvei-septicus bacterin. Total death loss was 12 head. Only two or three deaths from Clostridium occurred in 1951. In early 1952, an 18-month-old heifer and a seven-year-old cow were found dead on pasture. Autopsy revealed large, black prescapular and cervical lymph glands, some visceral petechiation and hemorrhages, and some gas bubbles in the cervical muscles. The diagnostic laboratory again reported *Cl. septicum*. All animals under 28 months of age were vaccinated with chauvei-septicus bacterin and, as losses continued, cattle of all ages were revaccinated. The total loss was 15 head, all purbreds, of the following ages: One, seven months; six, one yr. to 16 months; 4, 20 to 28 months; 4, five to nine years. The clostridial culture isolated in this outbreak was submitted to another laboratory for type verification. It was typed out as *Cl. novyi*.

Since October 1952, all young cattle, and the calf crop, have been vaccinated with *Cl. novyi* bacterin two weeks after their usual dose of chauvei-septicus bacterin. Up to this time no further losses from clostridial infections have occurred.

Differentiation

The problem of differential diagnosis in cattle showing visceral hemorrhages and hemoglobinuria is a tough problem. In many instances, it is not possible to establish diagnosis until more than one animal has died. The problem also is difficult for the diagnostic laboratory for animal inoculations, differential culturing through a number of sugar media and finally seroagglutination and toxin-neutralization tests may be necessary to type conclusively the suspected anaerobe.

On the other hand, it is essential and important that practitioners have clear-cut identification of the involved microoganism. This is true because one can not stop perfringens losses by vaccination with hemolyticum bacterin or novyi losses by vaccination with septicus. These anaerobes do not cross-immunize. But, because of their economic importance it is not too much for practitioners to ask that their state laboratories be supplied with enough money to prepare for this type of differential diagnostic work.

Treatment

What about the treatment of these anaerobic infections? A few basic fundamentals are common to all of them:

1. There is great cardiac stress and weakness. Therefore, sick animals must be restrained and handled carefully to avoid fatal collapse.

2. Cardiac collapse is always a danger. Thus, long-lasting caffeine sodium benzoate or the new-type methyltetrazole type of stimulants are best.

3. As Records and Vawter[6] have so ably stated, there is a speed up and exhaustion of hormones of the adrenal cortex. Therefore, in valuable animals there is undoubtedly a specific indication for one or more spaced doses of cortisone or ACTH.

4. In most anaerobic toxemia, but more notably in red water and perfringens infections, hemolysis of red blood cells is a major damage. Therefore, early use of 1,500 to 2,000 cc. doses of citrated blood are indicated. In gentle dairy cattle, direct transfusion by the Coffee method is preferable.

5. In true red water, specific antitoxin gives good results if used on early cases. It is of doubtful value when the red cell index has dropped below 4,000,000.

6. In beef animals, the best emergency treatment is 3 gm. of intravenous aureomycin backed by 3,000,000 units of slow penicillin

(Continued on page 297)

Spray Application For The Treatment Of Ringworm In Cattle

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RINGWORM in cattle is an infectious disease produced by members of the genus Trichophyton. Since other writers[2,3,4,5,6] have presented discussions pertaining to the etiology, symptomatology, pathogenesis, and pathology of this disease, no additional comments on these factors are necessary here. This report is concerned chiefly with application of a drug of relatively low toxicity in the treatment of an extensive outbreak of ringworm.

The recommended treatment of ringworm in cattle has consisted largely of removing the crusts and clipping the hair around the lesion followed by the application of an ointment or solution containing a fungicidal compound. In most cases, it is necessary to repeat the application several times in order to heal the lesions. In addition, many of the smaller lesions are not detected and go untreated until they become well established. This type of treatment may be suitable for individual animals, but in epidemics involving relatively large numbers it is tedious and often unsatisfactory. Consequently, when the outbreak described in the following paragraphs was encountered, it was decided to use captan† in an attempt to control the disease.

The word "captan" is a coined name for the fungicide, N-trichloromethyl-mercapto-4-cyclohexene-1, 2-dicarboximide. When applied in the form of a wettable powder the toxicity to warm blooded animals is low. The $l.d._{50}$ of a single oral dose in rats is reported to be greater than 15 gm. per kg.[4]. The same report indicates that application of concentrated suspensions to the skin failed to produce toxic symptoms. In man, some irritation has resulted when air has been sealed away from the skin where material is applied.

Captan has been used with satisfactory results in the treatment of girth itch in horses[1,3]. It has been reported that the same preparation, which contains 45% active ingredients, used at the rate of 1 lb. in 20 gal. of water, and applied by spray at 400 to 600 lb. nozzle pressure, resulted in successful healing of ringworm lesions in cattle[1]. This same report states that in outbreaks of ringworm in several swine herds, spraying with the same concentration resulted in healed lesions and a normal skin at the end of two weeks.

Case Report

Seven hundred Holstein-Friesian heifers, one and two years of age, were shipped from Wisconsin to Suisun, California, during October and early November of 1953. At the time the animals arrived, it was noted that eight or ten of them had visible ringworm lesions. By the end of November there were 30 to 40 animals involved and the owner began treatment with a solution of Churchill's iodine. Although some success was obtained, insofar as individual lesions were concerned, the condition spread rapidly to other animals and more lesions appeared on those already treated. In early January, 1954, one of the authors (N.F.B.) examined two animals which were brought to the University of California Veterinary Clinic and confirmed the owner's diagnosis of ringworm. Attempts to culture the organism on Sabouraud's glucose for specific indentification were unsuccessful because of the rapid overgrowth of extraneous saprophytic fungi. Nine days later the ranch was visited to examine the herd and instigate therapy. At this time from 300 to 400 animals were exhibiting lesions. Most were confined to areas around the eyes, ears, neck, and perineal regions. However, there were extensive lesions over the thorax, flank, and lumbar regions of some animals. No lesions were noted on the limbs of any animal. Many were showing marked pruritis.

Since the number of infected animals was increasing, it was decided that the entire herd should be considered as in the incubation

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†The authors wish to thank the California Spray-Chemical Corp., Richmond, Calif., for spraying material used in this work

stages and ought to be treated as if infected. Since the material had such a low reported oral toxicity, the corrals, feed racks and other areas where the animals congregated could well be sprayed.

For spraying, material was mixed so there was a concentration of 0.45 to 0.5 lb. of the active ingredient, captan, in 20 gallons of water. This was applied at a pressure of 400 to 450 lb. at the pump, using an average of one and one-half gallons per animal. No untoward symptoms or irritation resulted from the application and the cattle were returned to pasture.

The owner reported that after five days few of the cattle were showing signs of pruritis and that he had not noted any new cases.

At two weeks the animals were brought in for a second spraying, and were again examined. It was estimated that 60 to 80% of the lesions had lost the asbestos crust and that half of these were no longer showing desquamation, while hair was being replaced in the other half. There appeared to be no increase in morbidity and it was believed that the spread of the infection had stopped. Where active lesions were found, they were largely confined to the inside of the ears, around the eyes, and in the perineal regions.

Thirty-three days later the animals were examined again and it was estimated that only 1 to 3% had active lesions, and that of these only a few had more than one or two small lesions. It was recommended that these animals be segregated and hand treated with the material, using a stiff brush for application.

Discussion

It is impossible to separate fully the effect of the therapy used in this outbreak from extraneous factors such as immunity and spontaneous recovery as the result of sunlight and changes in nutrition. However, the fact that the condition was so rapidly arrested, both in cases of relatively long standing and those of short duration, and the spread of infection to additional animals was stopped, presents strong evidence that the material was efficacious. In addition, lesions which were observed during the process of healing, with the exception of a small number, did not show the stage known as Trichophytia circinata,[7] and desquamation had stopped while growth of new hair had begun in as short a period as two weeks, both lending support to this evidence.

It is not known what effect spraying of corrals and other structures might have played in the arrest of the outbreak. The fact that the fungus can resist drying for over a year[7] and that normal calves often contract the disease when placed in quarters where infected calves have not been for several months[8] suggests possible prophylactic use of this material. The application of the material by spraying the entire body of visibly infected and contact animals has two valuable features: First, it aids greatly in prophylaxis and treatment, since even those lesions which are in too early a stage to be detected are treated, and second, it is possible to treat large groups rapidly with a minimal amount of restraint and handling.

Summary

An outbreak of ringworm in a herd of 700 heifers, one and two years of age, in which more than 50% morbidity occurred, apparently was successfully treated by spraying with a suspension of captan. It was impossible to properly control the experiment and the efficiency of the compound is, therefore, postulated on the basis of the course taken by the outbreak before and following treatment.

It is concluded, in view of the ease of application and the apparent efficacy of this compound in treatment of ringworm, that the material warrants further clinical evaluation.

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Proper care is the price that always must be paid for vigor and health in farm animals. This includes an immense number of considerations. Proper care is essential to development and maintenance of vitality, which often amounts to practical immunity to many diseases.

Anthrax In Livestock During 1953 And A Review Of Data On Incidence From 1945 To 1953

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A REVIEW of the data covering the incidence of anthrax in livestock from 1945 through 1952 collected by Bureau surveys[1,2,3] reveals that during this eight-year period 2,785 outbreaks were reported from 38 states with losses of 14,708 head of livestock with an estimated value of $1,387,500. Outbreaks in new areas were reported from 422 counties.

Most of those reported from 1945 to 1951 were sporadic with minor losses of livestock. However, two major outbreaks with heavy losses occurred in Louisiana, while sharp outbreaks involving considerable losses occurred in Arkansas, Alabama, California, Colorado, Mississippi, Missouri, Nevada, South Dakota, and Texas.

In 1951 a marked increase in the incidence of anthrax occurred when 483 outbreaks were reported from 25 states.

The greatest losses were reported from southeastern Missouri and adjoining areas along the Mississippi River in Kentucky and Tennessee, where 302 outbreaks with losses of 1,152 head of livestock occurred. Anthrax also appeared in Florida for the first time in more than 20 years, when 21 outbreaks were reported from three counties with a loss of 206 cattle.

The outbreaks of undetermined origin, principally in swine, reported from Illinois, Iowa, Indiana, and Ohio in areas in which the disease is not enzootic were of special significance and interest, since they appeared to form a pattern of what was to occur in the early part of 1952 in swine herds in the Midwest. The heavy losses of swine from anthrax, especially in Illinois, Iowa, Kentucky, and Missouri were also an unusual feature of the disease in 1951.

The greatest number of outbreaks ever to be recorded for any single year occurred in 1952 when 1,644 outbreaks were reported from 32 states involving the loss of 3,451 head of livestock.

The tremendous increase in incidence in 1952 was due chiefly to the widespread outbreaks of low mortality of food origin that occurred in swine herds in the Midwest and to postvaccination outbreaks that occurred in cattle herds in Kansas and New Jersey.

The suspected source of infection reported in connection with the 1952 outbreaks were as follows: Contaminated feed 41%, postvaccination 25%, soil infection 20%, and unknown 14%.

1953 Survey

The data presented in this report are based chiefly on the information contained in the monthly reports on incidence of anthrax in livestock submitted to the Bureau by the livestock sanitary officials of the different states and territories.

Data compiled from these show that during 1953 there were 233 anthrax outbreaks in animals reported from 26 states involving 121 counties, with livestock losses of 409 cattle, 127 swine, 51 sheep, 8 horses, and 2 mules. (Tables 1-2-3).

With the exception of widespread outbreaks that occurred in Illinois and a marked increase in sporadic outbreaks in South Dakota, 1953 can be considered an average anthrax year. Most of the outbreaks were sporadic, occurred in recognized anthrax areas, involved chiefly cattle, and losses were comparatively small.

In 1953, outbreaks in 37 counties which had no recorded previous history of the disease were reported as follows: From one county each in Florida, Indiana, Montana, North Dakota, Texas, Virginia, and Wisconsin; two counties each in Arkansas, Minnesota, and Oklahoma, three counties each in Nebraska and Washington; four counties in Illinois; six counties in Missouri; and eight counties in Iowa. In this connection it should be pointed out that each year from 1945 through 1953 many outbreaks have occurred in new areas.

Outbreaks in sheep were reported from California where a loss of 27 head occurred, and from Illinois where a loss of 24 animals

*Animal Disease and Parasite Research Branch, Agriculture Research Service, U. S. Department of Agriculture.

TABLE 1. States Reporting Anthrax Outbreaks in Livestock in 1953 and Data on Incidence[1]

State	No. Counties	No. Outbreaks	Cattle	Losses from Anthrax: Swine	Losses from Anthrax: Misc.	Total	Suspected source of infection: Soil	Suspected source of infection: Feed	Suspected source of infection: Unknown	Outbreaks confirmed by Lab. exam.
Arkansas	3	6	23	—	—	23	6	—	—	6
California	7	11	18	—	27 sheep	45	11	—	—	10
Colorado	2	3	8	—	—	8	3	—	—	3
Florida	4	13	45	—	—	45	6	—	7	13
Georgia	1	1	Not reported			0	—	—	1	0
Illinois	8	46	49	54	7 horses 24 sheep	134	—	—	46	44
Indiana	2	2	2	1		3	—	—	2	2
Iowa	12	16	16	15	—	31	—	—	16	13
Kansas	2	6	6	—	—	6	5	—	1	6
Louisana	10	15	40	—	—	40	14	—	1*	0***
Minnesota	5	8	13	—	86 mink	15**	2	1	5	8
Missouri	6	10	11	30	—	41	—	2	8	8
Montana	1	1	1	—	—	1	—	1	—	1
Nebraska	10	11	12	20	—	32	2	2	7	11
Nevada	1	2	3	—	—	3	2	—	—	2
New Jersey	2	2	2	—	—	2	2	—	—	2
New Mexico	1	1	2	—	—	2	1	—	—	1
New York	4	5	9	—	—	9	2	—	3	5
North Dakota	1	1	3	—	—	3	1	—	—	1
Oklahoma	3	3	10	6	—	16	—	—	3	3
Oregon	1	1	2	—	—	2	1	—	—	0
South Dakota	16	44	81	—	1 horse	82	44	—	—	35
Texas	13	19	43	—	2 mules	45	—	—	19	19
Virginia	1	1	3	—	—	3	—	—	1	1
Washington	3	3	5	—	—	5	2	—	1	3
Wisconsin	2	2	2	1	—	3	—	2	—	2
26	121	233	409	127	8 horses 51 sheep 86 mink 2 mules	597	104	8	121	199

[1]Data based on corrected monthly reports on incidence
*A post vaccination case
**Does not include 86 mink
***Based on clinical diagnosis

TABLE 2. Monthly and Quarterly Incidence of Anthrax in Livestock for 1953[1]

Totals for each quarter	Month	No. of states reporting	No. of outbreaks	Livestock losses: Cattle	Swine	Sheep	Equines	Misc.
	January	12	20	21	30	0	0	0
	February	14	21	30	16	0	0	0
	March	9	12	16	4	0	0	0
First quarter		—	53	67	50	0	0	0
	April	12	23	32	9	27	0	0
	May	10	13	17	10	0	0	0
	June	9	11	21	0	0	0	0
Second quarter		—	47	70	19	27	0	0
	July	9	55	124	43	24	5	0
	August	9	31	53	8	0	3	86 mink
	September	8	24	42	3	0	0	0
Third quarter		—	110	219	54	24	8	86 mink
	October	5	8	24	0	0	0	0
	November	6	9	14	3	0	0	0
	December	4	6	15	1	0	2	0
Fourth quarter		—	23	53	4	0	2	0
Totals for year		*	233	409	127	51	10	86 mink

[1]Data based on corrected monthly reports on incidence
*Number of different states reporting—26

occurred.

The widespread outbreaks that occurred in July and August in Clay, Wayne, and Richland counties in the southeastern part of Illinois, an area where anthrax had never been previously diagnosed, were of considerable interest.

Approximately 40 farms were involved with a loss of more than 100 head of livestock. The source of the outbreaks were not determined definitely, but since little or no feed supplement is used in this area, and since most cases occurred in animals on pasture, soil infection was suspected. A long period of extremely dry, hot weather, and the prevalence of an unusually large number of horse flies were some of the factors that appeared to influence the rapid spread of the infection in this area.

The outbreaks in this area were brought under control by the state livestock sanitary officials, by strict police measures to combat the spread of the infection and wide scale vaccination of exposed animals.

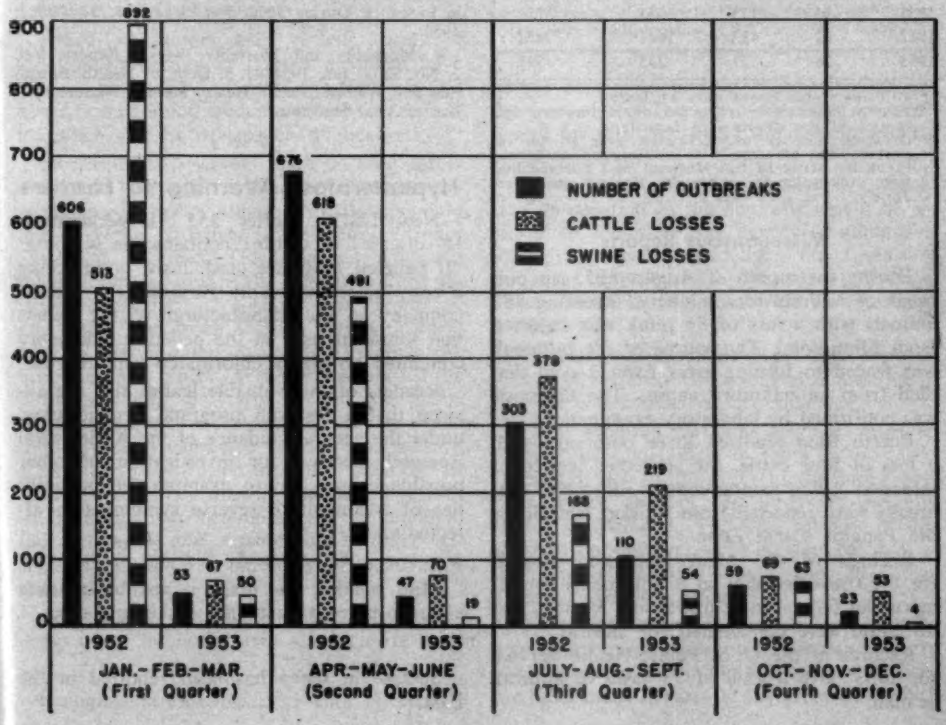
The 44 outbreaks reported by South Dakota in 1953 represents a sharp increase in incidence and greatest number of outbreaks reported by that state since 1942.

The fact that the six outbreaks reported from Missouri and that eight to 12 outbreaks reported from Iowa occurred in new areas appears to indicate the disease is becoming more widespread in these states.

It is generally believed that naturally occurring anthrax in livestock is a seasonal disease and that in most parts of the United States it is more prevalent during the summer months when the weather is extremely hot, and when flies are most numerous. A study of the monthly reports for 1953 confirms this opinion as the majority of the outbreaks and greatest losses occurred in the third quarter of the year (July, August, and September). (Table 2 and Graph 1).

The suspected sources of infection reported in connection with the 1953 outbreaks were as follows: Infected soil 44.4%; contaminated feed 3.4%; and unknown 51.5%. Of

COMPARATIVE INCIDENCE OF ANTHRAX IN CATTLE AND SWINE FOR EACH QUARTER OF 1952 AND 1953



the 233 outbreaks reported 199 were confirmed by laboratory examination. (Table 1).

The anthrax picture of 1953 presents a marked contrast to the situation that existed in 1952. For example, Indiana, Michigan, and Ohio that reported numerous outbreaks of food origin in swine herds in 1952, reported little or no anthrax during 1953, while a marked decrease in swine anthrax was reported from Iowa and Illinois. Kansas and New Jersey, where postvaccination outbreaks in cattle occurred in 1952, likewise reported few outbreaks in 1953. This would appear to indicate that no serious soil infection had occurred in those areas as a result of the outbreaks that occurred in 1952. (Graph 1 and Table 3).

TABLE 3. Summarized Data on Incidence of Anthrax in Livestock, 1945 to 1953 Inclusive

Year	No. states reporting	No. counties involved	No. outbreaks	Livestock losses*
1945	14	52	97	583
1946	18	82	163	4019**
1947	19	65	124	880
1948	14	63	120	1654**
1949	16	57	93	773
1950	12	55	61	595
1951	25	113	483	2753
1952	32	432	1644***	3451
1953	26	121	233	597

*In some states losses were estimated.
**Heavy losses were reported during severe epizootics of the diseases in Louisiana.
***Greatest number of outbreaks ever to be reported; due principally to widespread outbreaks in swine herds in the Midwest and postvaccination outbreaks in cattle in Kansas and New Jersey.

Miscellaneous Reports

During the month of August 1953 an outbreak of anthrax in a minkery, involving 883 animals with a loss of 86 mink was reported from Minnesota. The source of the outbreak was traced to feeding meat from a cow that died from an unknown cause. The diagnosis was confirmed by laboratory examination.

Puerto Rico reported three outbreaks with a loss of four cattle, the suspected source of infection being contaminated soil. No outbreaks were reported from Alaska, Hawaii, or the Panama Canal Zone.

Records of the Meat Inspection Branch for 1953 revealed that, at establisments operating under federal meat inspection, 54 hogs and no cattle were condemned for anthrax.

Records of the U. S. Public Health Service for 1953[4] give a total of 33 cases of anthrax in man.

Summary

Results of a nation-wide survey to determine the incidence of anthrax in livestock in 1953 indicate that 233 outbreaks were reported from 26 states, involving 121 counties, with a loss of 409 cattle, 127 swine, 51 sheep, 8 horses, and 2 mules. Aside from Illinois and South Dakota, where numerous outbreaks occurred, most were sporadic, occurred in old anthrax areas, involved principally cattle, and losses were comparatively small. Outbreaks in new areas were reported from 15 states. One outbreak in a minkery with a loss of 86 animals was reported from Minnesota.

The incidence of the disease in animals from 1945 through 1952 is reviewed briefly and reveals that during this eight-year period 2,785 outbreaks were reported with losses of 14,700 head of livestock.

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Hyperkeratosis Warning to Farmers

New USDA leaflet 355 (Hyperkeratosis [X disease] of Cattle) contains the warning: "If pelleted feeds are used, insist upon seeing a copy of the warranty furnished by the oil company to the manufacturer of the pellets that lubricant used in the pelleting machinery contained no highly chlorinated naphthalene."

Readers of this valuable leaflet also are advised that a research program is continuing, under the general guidance of the Agricultural Research Service, for investigation of other possible causes and to examine the possibilities of treatment to reverse symptoms in affected cattle.

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Mild weather has made it possible to save a larger percentage of the spring pig crop.

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SMALL ANIMAL PRACTICE
V M

Sedative Restraint In The Dog

FRANCIS T. CANDLIN, D.V.M., Denver, Colorado

The author states that the problem of restraint of small animal patients is a continually occurring one in daily practice routine.

The subject has been given too little attention considering the importance of proper and adequate restraint to quiet fears and calm the nervous dog to facilitate prompt healing and to avoid molestation of lesions, or self-mutilation.

Doctor Candlin discusses in this article various chemotherapeutic agents he has found useful as sedatives in his practice.

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Every practitioner uses various forms of sedation. Sedatives in human medicine have reached proportions of enormity; their use and abuse is mentioned frequently both in medical literature and in newspaper publications.

Surprisingly, however, there is little information to be found in veterinary literature regarding sedatives or sedation. Milks[1] has only one reference, Sedatives to the Genito-Urinary System, in the index. This is the only comment made about sedation. The author prefers, instead, to discuss such agents under hypnotics, and under the group suggests opium, chloral hydrate, barbiturates, demerol,®[1] paraldehyde, bromides, and others. Wright[2] does not list the term "sedation" or "hypnosis" in the index. He does discuss narcosis of the dog, in which the only drug suggested is morphine sulfate. Kirk[3], does not mention the term "sedation" or "sedative"; neither does he mention hypnosis or hypnotics. No references can be found in the *Journal of the American Veterinary Association* for the past ten years on sedatives or sedation.

Stephenson and Mjttelstaedt[4] list seven drugs under hypnotics, two of which are trade names of the same drug. Under "sedatives" there are nine listings, two of which are trade names for the same drug, and two are strictly cough sedatives.

Because of this apparent paucity of information on sedation in the dog, one would be inclined to feel that this particular adjunct is little used in canine medicine. Yet, I am sure this is far from the truth. This form of therapy does assume an important role in veterinary medicine.

As a comparison, Beckman[5] lists approximately 40 different conditions in human medicine for which sedatives are indicated.

These remarks certainly are not intended to be disparaging since, in some of the references, the use of the term in the index perhaps is not apropos. In others it certainly should be included. The chief purpose of this comparison, however, is to indicate the lack of information available about this particular aspect of canine medicine.

We are particularly limited in our ability to gain cooperation with our patients by mere vocal encouragement. Only in special instances are mechanical devices of any great value since

[1] ®Winthrop-Stearns, Inc., New York, N. Y.

the 233 outbreaks reported 199 were confirmed by laboratory examination. (Table 1).

The anthrax picture of 1953 presents a marked contrast to the situation that existed in 1952. For example, Indiana, Michigan, and Ohio that reported numerous outbreaks of food origin in swine herds in 1952, reported little or no anthrax during 1953, while a marked decrease in swine anthrax was reported from Iowa and Illinois. Kansas and New Jersey, where postvaccination outbreaks in cattle occurred in 1952, likewise reported few outbreaks in 1953. This would appear to indicate that no serious soil infection had occurred in those areas as a result of the outbreaks that occurred in 1952. (Graph 1 and Table 3).

TABLE 3. Summarized Data on Incidence of Anthrax in Livestock, 1945 to 1953 Inclusive

Year	No. states reporting	No. counties involved	No. outbreaks	Livestock losses*
1945	14	52	97	583
1946	18	82	163	4019**
1947	19	65	124	880
1948	14	63	120	1654**
1949	16	57	93	773
1950	12	55	61	595
1951	25	113	483	2753
1952	32	432	1644***	3451
1953	26	121	233	597

*In some states losses were estimated.
**Heavy losses were reported during severe epizootics of the diseases in Louisiana.
***Greatest number of outbreaks ever to be reported; due principally to widespread outbreaks in swine herds in the Midwest and postvaccination outbreaks in cattle in Kansas and New Jersey.

Miscellaneous Reports

During the month of August 1953 an outbreak of anthrax in a minkery, involving 883 animals with a loss of 86 mink was reported from Minnesota. The source of the outbreak was traced to feeding meat from a cow that died from an unknown cause. The diagnosis was confirmed by laboratory examination.

Puerto Rico reported three outbreaks with a loss of four cattle, the suspected source of infection being contaminated soil. No outbreaks were reported from Alaska, Hawaii, or the Panama Canal Zone.

Records of the Meat Inspection Branch for 1953 revealed that, at establisments operating under federal meat inspection, 54 hogs and no cattle were condemned for anthrax.

Records of the U. S. Public Health Service for 1953[4] give a total of 33 cases of anthrax in man.

Summary

Results of a nation-wide survey to determine the incidence of anthrax in livestock in 1953 indicate that 233 outbreaks were reported from 26 states, involving 121 counties, with a loss of 409 cattle, 127 swine, 51 sheep, 8 horses, and 2 mules. Aside from Illinois and South Dakota, where numerous outbreaks occurred, most were sporadic, occurred in old anthrax areas, involved principally cattle, and losses were comparatively small. Outbreaks in new areas were reported from 15 states. One outbreak in a minkery with a loss of 86 animals was reported from Minnesota.

The incidence of the disease in animals from 1945 through 1952 is reviewed briefly and reveals that during this eight-year period 2,785 outbreaks were reported with losses of 14,700 head of livestock.

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Hyperkeratosis Warning to Farmers

New USDA leaflet 355 (Hyperkeratosis [X disease] of Cattle) contains the warning: "If pelleted feeds are used, insist upon seeing a copy of the warranty furnished by the oil company to the manufacturer of the pellets that lubricant used in the pelleting machinery contained no highly chlorinated naphthalene."

Readers of this valuable leaflet also are advised that a research program is continuing, under the general guidance of the Agricultural Research Service, for investigation of other possible causes and to examine the possibilities of treatment to reverse symptoms in affected cattle.

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We are particularly limited in our ability to gain cooperation with our patients by mere vocal encouragement. Only in special instances are mechanical devices of any great value since

®[1] Winthrop-Stearns, Inc., New York, N. Y.

often they produce frustration both for the patient and the client. It is rather obvious that great use can be made, and is being made, of sedative restraint in canine patients.

Some forms of sedation have been used when necessary. But, in many instances, because of the unfavorable side reactions observed in animals following their administration, they have been considered unsatisfactory. Drugs of this type are bromides, opiates, chloral hydrate, *et cetera*. After the introduction of barbiturates, old agents fell into disuse. The barbiturates are exceptionally popular in human medicine as compared to veterinary medicine, where their use has been confined principally to general anesthesia. This may be due in part to the fact that barbiturates in dogs, in small doses desirable for sedation, tend instead to produce excitation. Doses large enough to produce sedation usually put the animal in such a state of stupor that it usually is unable to eat or drink. This defeats the original purpose, since a good sedative may be defined as one which, when given in minimum doses, will not only produce a calming effect without excitation but also will allow the animal to eat and drink. Further, the animal should be unaware of the pathologic condition which it may be trying to aggravate physically.

Drugs used for the purpose just mentioned, fall into the category of depressants to the central nervous system. The various descriptive terms are classified by the degree of stupor which they produce. From the state of consciousness to the state of unconsciousness we have as follows: Sedation, hypnosis, narcosis, paralysis, and death.

Sedation is defined by Dorland[4] as "the act or process of calming". He considers sedatives as "drugs that allay activity and excitement". Sedatives also may be classified for specific uses, such as cardiac sedatives, gastric sedatives, and general sedatives.

Dorland[4] defines hynosis as "sleep, specifically, a trance-like condition induced artifically". He defines hypnotics as agents inducing sleep. Narcosis as produced by a drug is a state of profound unconsciousness, while a narcotic is any drug which produces sleep or stupor, yet, at the same time, relieves pain. Anesthesia is the "loss of feeling or sensation, especially loss of tactile sensibility, though the term is used for loss of any of the other senses". Anesthesia does not necessarily imply unconsciousness. An anesthetic agent is one that produces anesthesia or induces the loss of the sense of touch or pain.

Indications

One of the indications for sedative restraint in the dog is to prevent the animal from traumatizing any condition. This covers a multitude of situations since there are diseases of the eye, ear, skin, central nervous system, cosmetic surgery, surgical repair of infected wounds and the relief of anxiety and pain. Naturaly, most forms of sterile surgery, require little or no sedative restraint, since a dog rarely, if ever, annoys a sterile wound. If a dog persistently licks such wound, some slip has been made in asepsis. All of us are aware of relatively simple conditions showing acute exacerbartions due to self-inflected trauma. To be more specific, diseases of the eye, particularly those involving either the lids, the conjunctiva, or the cornea, are better managed with the use of sedation. Local anesthesia of the eye is frowned upon, since it tends to retard healing, and does away with the most important protective element, pain.

Sedatives are indicated also for diseases of the ear, any type of otitis externa, hematomas of the conchal cartilage, following the removal of foreign bodies from the ear canal, stings and bites, and wounds of the ear and ear canal. Removal of a simple body from the ear may develop into acute otitis externa caused by shaking the head and scratching at the conchal cartilage. The large, round, so-called, moist eczema lesion over the external ear canal is familiar as a result of self-inflicted injury by scratching over that area with the paw.

In diseases of the skin, all so-called moist eczema lesions, at least in the experience of my practice, are always self-inflicted. (A moist eczema lesion that is not self-inflicted, is a medical rarity in my practice.) Killing the mosquito does not stop the mosquito bite from itching, nor, likewise, does destruction of the fleas and lice immediately terminate the itching sensation of the skin they produced. If the dog tramatizes itself sufficiently to produce moist dermatitis, cleansing of the skin with such agents as phisohex®[1], applying a bland ointment, followed by proper sedation usually will permit the lesions to heal without any further treament.

In diseases of the nervous system: Epileptiform convulsions, meningitis associated with spasms, trauma of the cord associated with spasms, the use of sedation is a grateful aid. The anxiety that is associated with shock, trauma, and pain can be relieved greatly with the use of sedatives. There are other examples

too numerous to review completely at this time.

Useful Agents

The three most used drugs in our practice for these purposes are: Aspirin (acetylsalicylic acid), demerol hydrochloride (meperdine hydrochloride), and delvinal®[2] (sodium vinbarbital). These drugs, either singly, or in combination, perform most effectively the effects desired in the sedation of the dog.

Of all the drugs, aspirin is probably the most widely used sedative. It is readily available in almost every home, and is most useful in calming a restless patient via the telephone at 2:00 a.m. Although it is both antipyretic and analgesic, it exerts a mild sedative effect. One 5 gr. tablet administered to a 20 or 25 lb. Cocker Spaniel will be found to exert a noticeable calming influence. To dogs of this size, one tablet three times a day will be found to be a fairly effective means of restraint. One or 2 gr. t.i.d. is satisfactory for smaller dogs and puppies under 10 lb. Aspirin is effective particularly in those conditions which are attended with pain and which, in turn, seems to produce a certain degree of restlessness. Thus, it is quite effective following the cleansing of an ear, extraction of a tooth, the removal of a foreign body, or in rheumatic or arthritic type pain. It is not so effective, however, in conditions associated with pruritis.

Demerol is one of our most useful drugs. It is first described in veterinary medical literature by Mayer.[7] It is a sedative as well as an antispasmodic and analgesic. We use it particularly in conditions associated with pain and those associated with shock and pain. Usually it is given at the rate of 3 mg. per lb. of body weight. The duration of effect is not long, so that when prolonged sedation and relief of pain is required, the combination of barbiturates, such as delvinal and demerol, have been found most effective. There seems to be favorable synergism between these two drugs which promotes periods of quiet and relief from pain up to ten or more hours. In addition to its use for preanesthesia, one of our favorite methods of using demerol is much like that reported by Schnelle,[8] in that he suggests the use of it during anesthesia, when the patient begins to tremble or become restless while still unconscious. We have found it to be so effective that we routinely have a 1 cc. sterile tuberculin syringe filled with demerol as a possible adjunct to carrying on a surgical porcedure. It may be inserted into a muscle without assistance and, after a few moments of waiting, one may continue with prolonged surgery, such as closure of an abdominal wound, without further assistance. We have used it in the same manner in combination with delvinal. If, after the injection of the barbiturate, the patient becomes slightly restless due to pain, 3 mg. of demerol per 1 lb. of body weight will immedately induce a state of quiescence usually lasting for several hours.

Although aspirin is our choice of sedative restraint for the ambulating dog, particularly when around home, delvinal is our choice as sedative restraint in hospitalized animals. It has proven to be a valuable sedative and hypnotic in almost every instance requiring sedative restraint. It was first reported in veterinary literature by Allison, Sealy and Morris[9].

This paper described the use of delvinal sodium for surgical anesthesia in the dog. The drug was given intravenously in doses of approximately 45 mg. per kg. of body weight since longer periods of surgical anesthesia can be produced with delvinal sodium than with amytal®[3] or pentobarbital. It was noted that doses of 25 mg. per kg. of body weight produced relaxation and sleep. These invetigators indicated that delvinal could be classed as a hypnotic of moderate duration. Their most important finding is that this new barbiturate produces no annoying reaction or violent movements during either the introduction or recovery periods, and therefore, may be given without preanesthetic treatment. It was this latter feature that caused us to investigate its effectiveness for sedation.

We first used a solution of delvinal in 5 cc. ampules containing 60 mg./cc. A review of some of the early cases treated with solution will give an idea of how the drug was used.

The first case was a 12-week-old Alaskan Husky weighing approximately 15 lb. that had convulsions associated with chronic distemper. Following the injection of 2 cc. or 120 mg. of the solution there was immediate relaxation without excitation, lasting approximately 24 hours. This dose was given once daily for seven days. The puppy recovered. During the period of treatment it continued to eat and drink.

The next case was a ten-year-old Cocker Spaniel with chronic eczema and self-inflicted dermatitis. This dog weighed approximately 25 lb. and was given 2 cc. or 120 mg., with excellent results.

®[2]Merck & Co., Rahway, N. J

®[3]Eli Lilly & Co., Indianapolis, Ind.

The third case was a Kerry Blue Terrier which had been in an automobile accident, with a suspected broken back. This dog, weighing approximately 40 lb., was given 150 mg. of demerol. While the dog appeared to derive relief from pain, restlessness and attempted movement were noted. Two cc. of delvinal were given. There was prompt and immediate sedation with no excitation.

Our fourth case was a Sealyham Terrier, a chronic barker. This animal had been hospitalized before and various forms of sedation used, all of which seemed only to excite. This 26-lb. dog was given 2 cc., or 120 mg., of delvinal solution with excellent results. Dose was repeated daily while the dog was in the hospital. The animal continued to eat and drink, but did not bark.

The fifth case was a Dachshund with a form of spondylitis, with severe spasms. Delvinal solution (120 mg.) was given which failed to relieve distress. Therapy was supplemented by 50 mg. of demerol which gave excellent relaxation over a period of 16 hours.

A 14-lb. Wire-Haired Terrier was presented having rapidly recurring convulsions associated with chronic distemper. He was given 2 cc., or 120 mg., of delvinal. No convulsions for 36 hours. We then injected 1 cc., or 60 mg., which had a quieting effect for an additional 24 hours. Thereafter, 60 mg. doses were repeated every 12 hours until the patient was sent home. During this time the animal not only showed no further evidence of convulsions, but continued to eat and drink.

A 30-lb. Springer Spaniel with severe, self-inflicted dermatitis of the ear, and moist dermatitis involving the adjacent area, was given 180 mg. of delvinal. This was followed by almost phenomenal relaxation and was repeated approximately every 24 hours until a cure was effected. During this period of sedation the animal displayed no signs of excitation and was able to eat and drink. After this trial, it was felt that approximately 6 mg. per lb. of body weight would be an effective sedative dose. If deeper relaxation is required, one may give up to approximately 10 mg. per lb. of body weight.

Toxicity of Sedative Agents

To determine toxicity we have injected delvinal in several dogs held for euthanasia. A 25-lb. Cocker Spaniel expired one-half hour after the administration of 15 cc., or 900 mg., of delvinal. A 23-lb. Wire-Haired Terrier was given 10 cc., or 600 mg., of the same barbituate. Pad reflexes were present after ten minutes, and a second dose of 5 cc., or 30 mg., was then administered. The animal expired 20 minutes later with marked cyanosis. Thus, 40 mg. per lb. of body weight were required for lethal effect.. The toxic dose is approximately four to six times greater than the required sedative dose.

In each case, no attempt was made to administer the drug slowly. The desired quantity was drawn into a syringe and given as rapidly as possible. Approximately one to two minutes later drowsiness appeared. Usually, when given the proper environment, patients slept.

After clinical trials with the sterile solution on approximately 50 dogs, it was decided to try delvinal sodium in capsule form to study the sedative effect of oral administration.

The dosage used here again was approximately 6 mg. per lb. of body weight, or about 1 gr. for each 10 lb. Two sizes were used, 0.1 gm., or 1½ gr., and 0.2 gm. or 3 gr. in capsules. The results were similar to those reported following the use of the solution, although, the period of induction consumed approximately one-half hour. At least 50 dogs now have been treated in this manner. Repeating the dose once every 12 hours usually maintains the desired effect. Approximately one hour after administration, if the animal is still restless due to pain or severe pruritis, small doses of demerol (3 mg. per lb. of body weight) always exert a noticeable quieting influence which lasts up to 12 hours or more.

The use of oral administration of delvinal sodium in the ambulatory patient is effective only when the client will cooperate by placing the animal in an atmosphere that will induce rest. If, however, the animal is allowed outdoors, or frequently is disturbed by playing children, or other normal stimuli, the effect of sedation is lost and the animal will attempt to move in a sort of staggering fashion. The results are unsatisfactory. Therefore, the cases for prescribing of oral capsules for home use must be screened carefully.

Contraindications

Acetylsalicylic acid (aspirin) should not be used over any lengthy period, *i.e.*, several days or more, unless guarded fully by sodium bicarbonate. Aspirin easily may induce acidosis. It may cause mild to severe gastric irritation in certain dogs. In those which vomit immediately after the adminstration of aspirin, 1 teaspoon of milk of magnesia and ¼ teaspoon of sodium bicarbonate administered with the aspirin, usually will allay such symptoms. A few show such severe reactions that it can be

attributed only to aspirin-hypersensitivity. Those animals with such a history should not be given the drug under any conditions. There are now available commercial preparations which contain alkalizing agents which we have found to be beneficial to dogs irritated by the acidity of aspirin.

Demerol has been found to be relatively free of contraindications in our practice. We have observed certain dogs, however, particularly Boston Terriers and those related to this group, in which small doses of demerol produce severe excitation, rather than depression. These animals pant violently, have an apprehensive expression, and react in an exaggerated fashion to normal stimuli, such as sounds or moderate pain. In those animals in which demerol appeared to produce excitation, the concomitant administration of delvinal immediately produced relief of the excitation. We never have observed any respiratory depression with the use of demerol. Recently a new agent, nalline[®a] (N-allylnormorphine hydrochloride) was reported[10] available as a specific antidote against respiratory depression which may result from an overdosage or an unusual sensitivity to demerol hydrochloride.

Nalline also is a specific antagonist for respiratory depression caused by morphine, dihydromorphinone, methadone, and metapon[11-18]. It dose not antagonize the depressant effects of non-narcotic agents such as the barbiturates, ether, or nitrous oxide. It is given in doses of 3 to 10 mg., intravenously or intramuscularly.

No actual contraindications were encountered in the administration of delvinal, but in those patients which might be suffering from severe, infectious hepatitis or leptospirosis, producing severe hepatic disease, administration of any barbiturate is contraindicated. It also should be used cautiously in severe shock in which there might be marked hypotension. In the event of an untoward reaction in the administration of delvinal, the administration of hypertonic glucose and stimulant such as metrazol[®a] or caffein sodium benzoate is indicated.

Summary

An attempt has been made to review the use of agents for sedative restraint in the dog. Three drugs, demerol, delvinal, and aspirin are indicated and discussed as being particularly effective in the dog. Sedatives assume an important role in canine medicine since their use can shorten greatly the duration necessary for the treatment of many chronic conditions by inhibiting the dog from constant self-traumatization.

Addendum

Following the completion of this paper, I obtained a copy of Veterinary Pharmacology and Therapeutics by L. Meyer Jones, Professor of Pharmacology, Iowa State College, and I wish to note that this new publication contains both the term "sedation" and "sedatives" in the index. The author also defines sedation as "A milder degree of central depression in which the patient is awake, but calm and free of nervousness". And, in a chapter entitled "Hypnotics, Sedatives and Analgesics and Anti-Convulsants", is given a full discussion of this group of drugs, devoting approximately 22 pages to this important subject.

[®a]Bilhuber-Knoll Corp., Orange, N. J.

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Honey as Antistiffness Factor Source

Stiffness in joints of guinea pigs, resembling symptoms of arthritis in man, is relieved by feeding unheated honey or bee's wax. Nutritionist Julia Church, working with guinea pigs believes that comb honey contains an unknown vitamin absent in some believed-to-be complete, basal rations. The unknown is designated as the antistiffness factor.

Miss Church read a preliminary report before the meeting of the Federation of American Societies for Experimental Biology on investigational work in progress at the Oregon Medical Research Foundation.

A Preliminary Report On The Use Of Hydrocortisone And Hydrocortisone With Neomycin In Dogs And Cats†

J. LAVERE DAVIDSON,* D.V.M., Kalamazoo, Michigan

WHILE the steroid substances, cortisone (compound E) and hydrocortisone (compound F), have been available to the medical profession for a reasonable length of time, little has appeared in veterinary literature concerning the application of these substances in canine and feline practice. For the most part, these hormonal products have been used initially and chiefly in human beings; however, in the past year there has been an apparent decided increase in interest and actual use of these agents in animal medicine.

This preliminary report is centered on the use of hydrocortisone tablets, cortef®, orally in dogs and the use of a combination of hydrocortisone-neomycin sulfate ointment, neocortef®, in the treatment of inflammatory conditions.

Cortef (hydrocortisone) is a potent hormonal substance producing metabolic or physiologic effects similar to, but more pronounced than, those produced by cortisone acetate. In man, cortef has been reported useful in the treatment of rheumatoid arthritis, and to effect a clinical improvement in about the same manner and in the same diseases as cortisone acetate. However, smaller initial and maintenance doses are required to produce the antirheumatic effect.

Probably the chief difference between hydrocortisone and cortisone is the fact that hydrocortisone exerts a greater effect on carbohydrate metabolism and also a greater anti-inflammatory action than cortisone. Otherwise the biological activities of these two adrenal steroids are similar, in that they both cause deposition of glycogen in the liver, maintain the ability of the adrenalectomized animal to work, cause a fall in circulating eosinophils, produce atrophy of lymphoid tissue, increase resistance of the adrenalectomized animal to stress, produce sodium retention and potassium diuresis, and inhibit inflammatory response. The last action is exhibited by cortisone upon oral or parenteral administration and upon topical application to the eye, while hydrocortisone elicits anti-inflammatory action when applied topically to the skin, as well as the eye, and by oral or parenteral administration.

While the various effects of hydrocortisone are described, the mechanisms of its actions are unknown. In human patients with Addison's disease, cortisone and hydrocortisone regulate carbohydrate and protein metabolism and restore vigor and resistance. In the individual with functioning adrenal glands, its major action is the suppression of inflammation, almost regardless of cause. The relationship of liver glycogen deposition, other metabolic effects, and the fall in circulating eosinophils to the anti-inflammatory action remains a question for future solution.

In this preliminary study, hydrocortisone was used as cortef tablets, 10 mg. per tablet. When administered orally, approximately 70 mg. are equal in therapeutic effect to 100 mg. of cortisone acetate. This is important in establishing dosages and is also certainly useful from an economic standpoint. From our limited use of hydrocortisone orally, we feel it advisable to keep in mind that the precautions and contraindications are the same for this drug as for cortisone acetate. The reports in human beings on the use of hydrocortisone administered orally in rheumatoid arthritis by Dr. Edward W. Boland (*Annals of Rheumatic Diseases*, 12:125 [June], 1953, and Dr. David Adlersberg, *et al.* Oral Use of Hydrocortisone (compound F) in the Treatment of Sprue, *Archives of Internal Medicine*, 92:615 [Nov.], 1953), suggested to us the use of cortef tablets orally in the treatment of certain severe and seemingly intractable cases of otitis externa in dogs, which are reported here.

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†This paper was presented, in part, at the 47th annual meeting of the Alabama Veterinary Medical Association, Mobile, Ala., April 4-6, 1954.

*Medical Division, Dept. of Veterinary Medicine, The Upjohn Company.

®The Upjohn Co., Kalamazoo, Mich.

Neo-cortef Ointment in Dogs and Cats

A combination of hydrocortisone and the antibiotic substance, neomycin sulfate, as combined in ointment neo-cortef acetate (Upjohn), was used with remarkable results in the treatment of certain dermatoses and ear infections in dogs and cats.

This ointment, combining the anti-inflammatory action of hydrocortisone with the antibiotic action of the broad-spectrum antibiotic, neomycin sulfate, provides a useful tool for veterinary use in the treatment of certain skin, eye, and cutaneous infections, which are characterized not only by inflammation but also by bacterial infection.

The neo-cortef acetate ointments used in these studies consisted of two potencies of hydrocortisone: 1% and 2.5%. Neomycin sulfate concentration in each of these ointments was 0.5%. The 1% ointment was used in less severe conditions and the heavier concentration was used in severe dermatoses and severe cases of otitis externa. It was found that these ointments provided rapid relief of symptoms, were well tolerated, and apparently hastened or aided healing.

Case Histories and Reports

Case 1. German Shepherd, spayed female, age nine years. Diagnosis—chronic severe otitis externa with extensive swelling of the entire ear canal to the point that it was impossible to visualize the canal with the speculum of the Welsh-Allen otoscope. This animal had been treated for a period of a little over one year with many and varied types of treatment which possibly were responsible for some of the extensive thickening and swelling. When first seen, the animal was in severe discomfort, with a temperature of 102.2 F., and purulent maladorous discharge from both ears. The animal was scratching and shaking the head, almost continually.

It was felt that, inasmuch as many of the routine and older types of therapy had been used on this animal, neo-cortef ointment, 2.5%, should be employed with applications made once a day in each ear, and cortef tablets given orally. Starting dosage of the 10 mg. cortef tablets was two tablets morning and night or a total of 40 mg. per day. This apparently was an overdosage for this animal because of the transient nausea and vomiting which occurred but subsided upon reducing the dosage by ½ or 20 mg. daily, or 1—10 mg. tablet morning and night. This dosage was continued for the first week and then halved to 10 mg. a day, (5 mg. morning and night). The next week dosage was reduced again by ½ to 5 mg. daily or 2½ mg. morning and night. During this entire period of three weeks the patient's ears were treated locally once daily by application of a small quantity of the ointment.

At the end of the first four days, a remarkable improvement was noted. Swelling had begun to subside, the pustular discharge was definitely lessened, and the animal was more comfortable. At this time we were able to look into the ear with the speculum of the otoscope and note the satisfactory progress. At the end of three weeks both ears were definitely improved with the exception of a thickening of the lining of the ear canal. The owner was well pleased with end result.

Case 2. Cocker Spaniel, 14 years of age. This dog was presented with a chronic otitis externa of one ear which had been present, according to the owner, for at least five or six months. This case was of such severe nature it was thought best to start immediately with the neo-cortef ointment, 2.5%, applied once a day in the ear, after cleaning with dry cotton swabs. Cortef tablets, 10 mg., were prescribed at a rate of 10 mg. per day (5 mg. morning and night) and continued for one week, after which the dosage was halved to 5 mg. per day (2½ mg. morning and night). At the end of a two-week period, the ear had ceased to drain and healed in good shape.

Case 3. Cocker Spaniel, two years of age. This dog was presented with acute otitis externa of both ears. The ears were hot, swollen, and sensitive, and discharging a mucopurulent-type of exudate. Cleaning was effected with moistened cotton swabs, after which neo-cortef ointment, 1% was prescribed to be used once a day after the owner cleaned the ears as well as possible with cotton swabs. This animal was returned in two days. There was about a 50% improvement.

At that time, cortef tablets, 5 mg., were prescribed with a recommendation that 1 tablet be given per day (2½ mg. morning and night). This dosage was continued for one week at which time it was halved to 2½ mg. per day or ¼ tablet morning and night. At the end of a two-week period there was still a small discharge from the ear; however, the tenderness was relieved and, while healing was not complete, there was decided improvement. It is possible that a higher dosage of hydrocortisone was indicated in this particular case. However, it is felt that one should be careful in judging dosage at this preliminary stage on

the use of hydrocortisone in small animals due to the fact that overdoses may result in nausea and vomiting, which should be avoided.

Case 4. Boston Terrier. This animal was presented with an eczematous condition at the base of the tail, extending underneath the tail and into the groin. The lesion was moist and had been present for approximately two weeks. After the area was thoroughly cleaned, a small amount of 2.5% neo-cortef ointment was applied over the entire area. Results in this case considered good and treatment is being continued.

Case 5. Three cats were presented with severe keratoconjunctivitis to the point that photophobia was extreme. There was a severe edema of the lids with a thick, tenacious mucopurulent discharge. In the past we have found these cases most difficult to treat and usually show little or no response for at least a week to ten days or longer of treatment. The eyes were cleaned with sterile, distilled water, local anesthetic was applied to relax the lids and relieve the photophobia, after which neo-cortef, ophthalmic ointment, was applied three times a day. Two of the animals responded rapidly. In three days inflammation had subsided, the edema had disappeared entirely, the keratitis was clearing, and in six days they were apparently cured. The remaining animal, however, while the symptoms were relieved, condition progressed and a corneal ulcer developed and had to be treated with additional supportive therapy in order to effect a cure. In two of these cases, the results obtained with the new ophthalmic ointment, were satisfactory and appeared to effect relief of symptoms more rapidly than older type of treatments.

Case 6. A mature cat was presented with an infected fight wound in the right hind leg. It was swollen and infected. The wound being just above the foot resulted in disturbed locomotion. It was extremely sensitive to touch. The animal had an elevated temperature and, after the wound was cleaned, neo-cortef ointment, 1%, was applied under bandage in the form of a pack applied and changed every two days for three applications. Results were excellent; inflammation began to subside after the first two days and was entirely cleared in six days.

Case 7. English Bulldog, seven years of age. This dog was presented with a case of severe interdigital eczema, accompanied by numerous small abscesses between the toes, elevated temperature of 103.5 F., foot swollen, very tender. The areas were cleaned, the abscesses opened and the animal was given 22 cc. of veterinary dihydrocillin,® readimixed, intramuscularly. An ointment bandage pack was used on the foot and this was changed every day for the first three days, after which the bandage was left on for three days before changing. The penicillin-dihydrostreptomycin therapy was repeated at 24-hour intervals, giving a 2 cc. dose. All symptoms were alleviated by the end of nine days. Here again, we have found in the past that interdigital eczemas, accompanied by the small abscesses, have proved difficult to handle. These abscesses seem to appear almost like springs of water underground; after you get the initial one or two to the point of responding, others occur at some other area around the toe or neighboring toe. With the method of treatment employed, this difficulty was obviated, and recovery was progressively good from the time the treatment was started.

Summary

This preliminary report on the use of hydrocortisone tablets (cortef) in dogs and cats points out new forms of therapy in canine and feline practice. The combination treatment (cortef-neomycin) offers definite advantages in the treatment of chronic, ordinary obstinate, otitis externa in dogs. The use of neo-cortef ointments in eye infections and eczematous conditions in dogs and cats merits further clinical investigation and use.

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Heart-Beat Resumption After Freezing Temperature

Resumption of heart-beat in ten-day-old rabbit embryos after being kept at freezing temperature for several days has been reported to the annual meeting of the Federation of American Societies for Experimental Biology by Dr. M. C. Chang, physiologist at the Worcester Foundation for Experimental Biology, Shrewsbury, Mass.

Doctor Chang, an authority on early embryonic growth, livestock improvement, and problems of fertility, implies in his report that biochemical reactions such as heart beats can stop and subsequently be revived, and the tissue reactions must still exist at low temperatures even if no obvious indications, such as heart beat, are present.

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Of special interest are the thyroids of toy breeds of dogs. They have structure similar to that of newborn puppies, suggesting that these breeds, in certain ways, never grow up. —*The Genetics of the Dog.*

Hyaluronidase In The Management Of Canine Urolithiasis

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UROLITHIASIS is a problem of considerable importance in veterinary medicine, first, because of economic loss to the sheep and cattle industry[1] and second, because of sentimental considerations of pet animals.

The nature and process of urolith formation is not well understood, and methods of prevention or treatment are still inadequate. The medical management of urolithiasis usually has been directed either toward diminishing the concentration of crystalloids excreted in the urine, or freeing crystalline material from the stone to promote its disintegration. Such therapeutic measures have been relatively unsuccessful.

The formation of urinary calculi is a complex process. Possibly more than one factor is responsible. Suggestions as to factors of importance in their development have included: Vitamin A deficiency, ammoniacal fermentation, infection, deficient water consumption, excessive salt or mineral intake, and poor state of nutrition. Most recently, deficient concentration of protective urinary colloids has been suggested as a cause.

Although Lichtwitz[2] demonstrated the importance of colloids in increasing the solubility of the urinary crystalloidal components many years ago, the role of the protective urinary colloids has received little attention until recently.

The urine of most mammals is usually a highly saturated solution of complicated composition. Electrolytes and nonelectrolytes are dissolved in higher concentration than their solubility in water would indicate possible. It is now thought that this supersaturated condition is dependent upon the presence of protective colloids. From what is now known of the increase in solubility of stone-forming salts by certain colloids, it is logical to assume that if this protective power is decreased by alteration of the urinary colloids, crystal nuclei may become sensitized and stone formation may begin[3]. The presence of altered colloids may even augment the process by furnishing a nucleus for the absorption of salts[4]. It should be mentioned, however, that some observers believe that the salt concentration of the urine is of relatively minor importance in this process because calculi may occur in urine of low salt concentration and may not occur in urine of high concentration.

Once the process of calculus formation begins, the proper conditions for its continuance are maintained because the calculus itself furnishes a surface for further absorption of salts and colloidal material. In addition, the calculus is a foreign body which sets off an inflammatory reaction, the products of which may contribute to the organic framework of the concretion.

Prophylactic and therapeutic efforts now have been directed to the prevention of the precipitates by an increase in the concentration of the protective colloids.

While searching for a protective colloid that is excreted in the urine, it was found that following the subcutaneous injection of hyaluronidase (wydase®) in physiological saline solution, there was an appreciable reduction in surface tension of the urine and the minute, suspended particles became dispersed[5]. Because the hyaluronidase causes natural protective urinary colloids to set up a gel, it is thought that electrolytes can be prevented from crystallizing with consequent stone formation.

Clinical application of increasing the protective urinary colloids by parenteral injection of hyaluronidase in the treatment or prevention of urinary calculi in animals is a relatively new concept. The following five patients had histories of recurrent urinary calculi, at least two cystotomies having been performed on each previous to treatment. During the period covered by this report, no form of therapy other than hyaluronidase administration was employed in an attempt to combat stone re-formation.

Report of Five Cases

Case 1. Female Cocker Spaniel, approximately 4½ years of age with a history of two

®Wyeth Laboratories, Philadelphia, Pa.

cystotomies for calculi performed six months and two months before treatment with hyaluronidase was started. Twenty-five TR units of hyaluronidase were administered three times weekly for two months. The dose was increased to 50 TR units and was given three times a week for the following 15 months. No symptoms of calculi were apparent when treatment was discontinued because the client moved away.

Case 2. Female Wire-Haired Fox Terrier, about eight years of age with a history of four cystotomies for the removal of calculi performed 41, 32, 7, and 3 months before the start of treatment. Twenty-five TR units hyaluronidase were administered three times a week for two months and the dose was increased to 50 TR units three times a week for the following five months, when the presence of small cystic calculi, which were suspected, were noted on palpation and *x*-ray. The dose was increased to 100 TR units three times a week for the next five months. Stones continued to enlarge causing hematuria and pain. Five large and numerous small stones were removed by surgery.

Case 3. Female Cocker Spaniel, about ten years of age with a history of three cystotomies for calculi performed at 61, 56, and 29 months before the beginning of treatment. Twenty-five TR units of hyaluronidase were injected three times a week for the next two months. The dosage was increased to 50 TR units three times a week for the following 14 months. At this time the dog developed mammary carcinoma and was destroyed at the request of the owner. Autopsy was permitted and no calculi were found.

Case 4. Female Springer Spaniel, approximately 8½ years of age at the beginning of treatment. There was a history of two cystotomies for calculi performed 13 and two months previous to the initiation of treatment. Thirty TR units of hyaluronidase were administered three times a week for two months and the dose was increased to 60 TR units three times a week for the following 11 months when treatment was discontinued because the dog was removed to a summer residence.

Case 5. Female English Setter, about 7½ years of age when presented for treatment with a history of two cystotomies performed four months and one month previous to start of treatment. Treatment consisted of 50 TR units of hyaluronidase injected three times a week for 13 months when the dog was run over and killed by an automobile. No stones were found on autopsy.

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Business of Veterinary Practice

Veterinarians often consider business a sordid, mercenary activity, thoroughly riddled with crookedness and unethical goals. This impression is so firmly rooted that it is difficult to overcome, nor should it be entirely overcome. The profession soon would regress if overrun with rabid mercenaries.

It is true that professional skill is the *sine qua non* of professional success, but application of this skill under practice conditions, so that client, patient, and veterinarian may benefit, requires use of business skill. This necessitates honest recognition of their value, albeit they are not included in strictly professional realms.

Insofar as business creates order, efficient methods, greater client satisfaction, it is desirable. Whether the professional man likes it or not, he is engaged actively in the business of selling himself, his services, and his profession each and every day, and in doing so derives profit from his actions—*Kenneth B. Hass, Jr. D.V.M.*

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Biochemists generally follow the physiologilcal principle that chemical compounds which are almost—but not quite—identical often have directly opposite physiological effects on both man and animals.

A New Oral Anthelmintic For Canine Whipworms

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Many drugs and methods for their administration have been recommended for the relief of trichuriasis in dogs. All have certain shortcomings related to a number of characteristics of the infection. The author sets out in this report some observations on laboratory and field trials with a new, complex, organic compound on which some previous study indicated anthelmintic properties on screening tests.

Dogs known to harbor whipworms, as determined by fecal examination, were treated successfully in a limited number of cases. Toxicity was determined to be nil. Efficacy was determinded by post-treatment worm count at autopsy.

NEED for a convenient, safe, and effective agent to remove whipworms *(Trichuris vulpis)* from dogs long has been recognized by veterinarians. A few of the many drugs which have been used for this purpose include nicotine,[1] santonin, oil of chenopodium,[2] tetrachlorethylene, *n*-butyl chloride, methylbenzene,[3] hexylresorcinol[4] and hydrogen peroxide. Results of treatment, either orally or rectally, with these agents have been inconsistant. Recently Ehrenford[5,6] reported that 3-methyl-1-pentyn-3-yl sodium phthalate showed marked anthelmintic activity against this parasite. In order to investigate this compound further, a clinical research program was set up, using prepared tablets of the chemical designated as whipcide,† to treat whipworm-infected dogs at the Research Farm and in several small animal practices.

Methods of Procedure

Dogs used in the efficacy studies were selected on the basis of a positive flotation test for parasite ova. Two dosage schedules were followed:

1. *Fasted.* These dogs received only milk for approximately 24 hours and then were given one dose of the new agent at the rate of 250 mg./kg. body weight.

2. *Nonfasted.* These dogs received their regular ration the evening prior to treatment, then just before dosing were fed a small meat meal. Two doses (200 mg./kg. each) were administered morning and night approximately eight hours apart.

Animals treated were sacrificed five to seven days following dosing and the cecum and large colon of each examined carefully for parasites.

Results

Table 1 contains data on the efficacy of whipcide, based on autopsy findings. Of the 50 animals in group B that received a single 250 mg./kg. dose, 40 were freed of whipworms. Emesis occured in eight of these dogs. Since it was impossible to estimate the amount of drug lost by vomition, these are not included in the efficacy tabulation. Thus 40 of 42 dogs (95%) were freed of whipworms at this dose level. Of the 50 animals of group C that received two doses of 200 mg./kg. each, 44 were freed of infection. Emesis occurred in three of this group, and after excluding these animals, the remainder showed an efficacy rate of 95% (44 of 47 rendered parasite free).

In comparing the average number of whipworms found in the infected dogs on autopsy, the group A (controls) averaged 44 worms, group B averaged six worms and group C was 6.1 worms. Furthermore, in comparing the maximum number of worms present in any one dog on autopsy, group A had 260, group B had 14, and group C had 20. Thus, data indicates that even though complete elimination of the parasite was not accomplished, actual reduction of the parasite load probably occurred in the treated animals.

Table 2 depicts the safety of the drug when administered to pregnant bitches. The animals used in this test were dosed during various phases of the gestation period. All females whelped mature, apparently normal pups.

Results from clinical reports submitted by practicing veterinarians indicated the efficacy of the preparation as judged by post-treatment fecal examination. Forty-eight of the 60 animals were treated with the one-dose method. Thirty-six (75%) were freed of ova following this treatment. Eight of the 48 vomited following dosing and exclusion of these eight cases resulted in an efficacy of 90%. Not one of the 12 nonfasted animals vomited. These 12 cases were negative for ova after receiving the two 200 mg./kg. doses.

*Research Farm, Pitman-Moore Co.

†Trade name, Pitman-Moore Co., Indianapolis, Ind.

Comment

Whipcide is unique in that: (1) It is an entirely new anthelmintic, (2) preliminary fasting is not required; in fact it is recommended that the two-dose procedure be preceded with a light meal, (3) it is safe, and (4) it is effective.

With the exception of occasional emesis, no other toxic signs have been observed following the recommended therapeutic dose.

Whipworms can be observed in the stools of treated dogs within 24 hours after dosage. It is suggested that microscopic examination of the stool for ova be delayed for at least one week after treatment in order that all residual ova be eliminated.

Fig. 1. Severe canine whipworm infection of the large colon.

Controlled chronic toxicity studies were conducted on a litter of five- to six-week-old puppies. These received daily oral doses of whipcide, 250 mg./kg. for 30 days. Two pups were used as controls. The medication did not produce evidence of toxicity. Weight gains in the treated animals were equal to those of controls at termination of the experiment. Laboratory tests conducted on the five animals at the end of the 30-day test did not reveal any deviation between the treated and untreated individuals. This lack of toxicity has been verified in the clinical reports from practicing veterinarians and in dogs treated at the Research Farm.

Our present knowledge of whipworm infection indicates that in some areas a high percentage of the dogs harbor the parasite (Great Lakes region), while in other areas the parasite is rare (Rocky Mountain region).

Now that we have what appears to be a convenient, effective agent to treat canine trichuriasis, we are approaching a clearer understanding of the disease condition produced by the parasite. "Whipworm disease" is apparently an allergic syndrome characterized by persistant diarrhea (ulcerative colitis), dermatitis,

Table 1—Effects of Treatment of Dogs Infected With Whipworms

Group	No. dogs	Whipcide dose	No. freed on autopsy	No. not freed	Average no. worms found in animals not freed	Maximum no. worms found in any one animal not freed	Emesis	Efficacy of treatment in animals not vomiting
A	50	Controls (Untreated)	0	50	44	260	—	—
B	50	250 mg./kg. following milk fast	40 of 50	10	6.0 (ten dogs)	14	8	(40 out of 42) 95%
C	50	200 mg./kg. a.m. & p.m. following light meal	44 of 50	6	6.1 (six dogs)	20	3	(44 out of 47) 95%

nervousness, and unthriftiness. Severe infections (fig. 1) usually produce diarrhea, however, it should be pointed out that severe, hemorrhagic, mucoid diarrhea apparently can result from a light infection in some animals. Several reports have been received on cases that show insignificant numbers of ova yet exhibit symptoms of whipworm disease. Cases of this type frequently become symptom free after treatment with the new agent. Numerous reports have been received of successful treatment of clinical whipworm cases, especially of the diarrhea type. Unfortunately, confirming fecal tests frequently were not conducted when the disease symptoms were relieved.

Centrifuge flotation technics employing sodium dichromate, sugar, salt, or sodium nitrate solutions are generally satisfactory for demonstrating the ova in stool specimens. For those cases, however, in which the parasite infection is suspected, but ova are not identified by flotation, the direct smear procedure is advised.

Sometimes following dosing with whipcide the stool has a "skunk-like" odor; it may be prevented by dosing the dog with chlorophyll tablets.

While the mode of action of this drug is not known, its effectiveness is probably a result of intimate contact with the parasites in the cecum. The success of previous therapeutic agents was correlated with the ability to introduce the agent into the cecum*. Figure 2 illustrates the wide variation in cecal size found in dogs of approximately the same weight, emphasizing why cecal medication has been difficult.

Summary

1. A new oral anthelmintic agent, whipcide, used to treat 160 dogs infected with whipworms, was found to be convenient, safe, and effective.

Table 2—Result of Toxicity Studies in Pregnant Bitches

Dog No.	Dosage schedule	Days till welping	Number of pups*
1	250 mg./kg. (fasted, 1 dose)	6	5
2	" "	10	5
3	" "	4	7
4	" "	11	4
5	" "	5	7
6	200 mg./kg. (non-fasted, 2 doses)	49	7
7	" "	1	7
8	" "	48	7
9	" "	1	5

*The pups from each female were examined as soon after whelping as possible. Examination indicated all were normal and none premature.

Fig. 2. Variation in size of ceca from dogs of same weight range.

2. A controlled efficacy test, based on autopsy findings using one and two doses, freed 95% of the 100 animals treated.

3. Reports from practicing veterinarians revealed that complete elimination of ova resulted in all 12 cases receiving the two-dose schedule. Excluding the animals that vomited (8 of 48) in the one-dose program, 90% of the cases were negative for ova.

4. The only toxic sign observed at the recommended dose was vomition. Apparently the presence of food in the stomach minimizes this problem.

5. Administration of a therapeutic dose in nine pregnant females did not produce evidence of toxicity.

6. A controlled study using a litter of five- to six-week-old puppies in which whipcide was administered at the rate 250 mg./kg. failed to produce evidence of toxicity.

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The number of persons 65 years of age and over has increased by nearly 50% since 1940. *S. N. L.*

Vaccination of Mink with Distemper Vaccine, Modified Live Virus, During Gestation

L. B. TENNISON, B.S., D.V.M.,
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Protection of mink against distemper, by vaccination with modified live distemper virus, has been found to be an effective practical procedure. Cabasso, Burkhart, and Leaming[1] first reported favorable results in mink on two ranches, vaccinated after distemper had appeared on the premises. Spread of the disease was prevented by prompt vaccination, and mortality was held to a minimum. Normal whelping occurred and kits were vaccinated successfully at six to ten weeks of age. In both cases, diagnosis was confirmed in the laboratory. Much more extensive use of the modified live virus was reported by Hartsough and Gorham[2]. In their work, 35,000 mink on 23 ranches were vaccinated within two or three days of definite diagnosis, and mortality, due to distemper, was approximately 3%. While no studies have been made on duration of immunity in mink, Cabasso and his associates[3] recently have reported solid immunity in ferrets for at least two years following a single injection of the vaccine. They also found that ferrets were resistant to infection within 24 to 72 hours following vaccination.

The purpose of this report is to present results of experiments to determine if the modified live virus disemper vaccine,* administered to female mink at various times immediately before and during gestation, would have any effect on the number or health of kits born to these mink.

Field Vaccination Trial

This trial was conducted on a ranch of approximately 2,000 breeders, one section of which was set aside as the test area. A total of 59 females were vaccinated at different times before and after breeding. An additional 182 mink in the same section were left unvaccinated as controls, but otherwise were handled in exactly the same manner as the vaccinated animals. A regular commercial lot of vaccine was used, which, in the usual testing procedures, had been shown to be capable of immunizing distemper-susceptible ferrets against a lethal challenge of distemper virus. The recommended dose of 1 cc. was administered to each mink subcutaneously in the region over the ribs, just back of the elbow. As is shown in the table, 25 mink were vaccinated from 12 days before to the same day as breeding, and 34 were vaccinated from two to 55 days after breeding.

Comparison of whelping records of mink vaccinated with distemper vaccine—mink—modified live virus avianized, and unvaccinated mink

Time of Vaccination	Total females bred	No. non-whelping females (%)	No. litters lost	Tot. surviving kits	Avg. surviving kits per female (tot.)	Avg. surviving kits per whelping female
12 to 0 days before breeding	25	4 (16%)	3	76	3.04	3.62
2 to 55 days after breeding	34	7 (20.6%)	2	111	3.27	4.11
Unvaccinated controls	182	31 (17%)	2	587	3.22	3.89

The accompanying table gives the whelping record of both vaccinated and control animals. In the category, "Number of litters lost", normal whelping occurred, but the kits were lost from undetermined causes. From the figures presented, there appears to be little difference between the number of kits whelped per female in the three groups. The differences are well within the whelping range one would expect to observe among different groups of unvaccinated mink handled under similar conditions. Statistical analysis of the results failed to show any significant differences. In all cases, kits were normal and no differences could be detected between those whelped by vaccinated and unvaccinated females.

Comment

The results of this experiment seem to indicate that vaccination with the modified live virus distemper vaccine does not interfere with the normal reproduction of mink regardless of whether vaccine is administered immediately

*Distemper vaccine — mink — modified live virus (chick embryo origin—vacuum dried) avianized® Lederle Laboratories Div., Pearl River, N. Y.

before or at any time during the gestation period.

Acknowledgment

The author wishes to express his appreciation to Mr. Irving Pinchuck, Manager, Ramapo Mink Ranch, Spring Valley, N. Y., for his cooperation and assistance in the conduct of this trial, and to Mrs. D. Budd for assistance in the preparation of the manuscript.

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The Limited Therapeutic Use of Isonicotinic Acid Hydrozide on Chimpanzees as an Aid in the Treatment of Pulmonary Tuberculosis

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Treatment was limited to two seven-year-old female chimpanzees purchased at the age of two years by the Swope Park Zoo, Kansas City, Missouri. The chimpanzees were housed in the zoo building, partially behind glass, until the age of five when they were moved to quarters which allowed them indoor and outdoor accommodations.

Throughout the winter of 1952 and 1953 the animals were plagued continuously with tonsillitis, loss of appetite, increased irritability, rough hair coat, hair pulling, and repetitious body swaying. Pulmonary tuberculosis was suspected.

Diagnosis

The champanzees were subjected to the intradermal (upper eye lid) tuberculin test early in February 1953. Positive reactions were noted and a diagnosis of tuberculosis was made. This diagnosis was based on clinical symptoms plus positive tuberculin test.

Treatment

One chimpanzee, named Nan, exhibited more pronounced symptoms than the other. These were weight loss, anorexia, paleness, and depression.

At specified intervals each animal was injected, intramuscularly, with streptomycin and penicillin. The symptoms of upper respiratory congestion disappeared temporarily and the animal's appetites partially returned. This treatment had to be repeated a number of times with less results each time.

The stated results were becoming less favorable and the animals were difficult to treat due to the mode of administration. It was decided to give each animal a therapeutic dose of rimifon® 'Roche' commencing on April 15, 1953. The dosage was scheduled to be administered at the rate of 1 mg. per kg. of live weight, daily.

No drugs were administered for the next 15 days. At the end of that time, for a 15-day period just one animal, Nan, was given a second drug dose daily. The drug was administered in the feed with no resistance from the animals. The results were favorable in both chimpanzees. At the end of 60 days, Nan, who had shown the most advanced symptoms, responded by extraordinary improvement in color, appetite, weight gain, and temperament. As mentioned above, the use of rimifon was limited to only two chimpanzees who are now perfect specimens of healthy animals.

Editor's Note. Rimifon 'Roche' is a potent antituberculous drug. Chemically it is insonicotinylhydrazine, made available by the manufacturers as tablets and as a fruit-flavored syrup for oral use. The latter preparation was used in the case reported in the preceeding note.

Rimifon has been available for use for almost two years. There is a considerable amount of clinical literature to indicate its value in human medicine. It also has given satisfactory results in monkeys maintained in experimental laboratories. Few reports appear in veterinary literature in reference to the use of this agent. Readers are referred to, An Outbreak of Bovine Tuberculosis in Mink and Treatment with Rimifon, by Dr. Fred B. Pulling that appeared in the *Jour. Am. Vet. Med. Assn.*, 121:389 (Nov.) 1952.

A note from the Clinical Research Division (Hoffman-La Roche) indicated that those most familiar with this preparation were amazed at the rapidity and completeness of recovery

®Hoffman-La Roche, Inc., Nutley, New Jersey.

in the two chimpanzees treated. They consider it advisable to prolong treatment to make complete recovery certain. Further, larger doses than given might be used with safety; up to 4 to 5 mg. per kg. of live weight daily, continued for several months.

It has been estimated that 1,500,000 children will be vaccinated with the Salk vaccine (killed virus) for poliomyelitis this summer.

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Preliminary results of feeding experiments indicate that the optimal level of fat in diet for normal cats is approximately 4.3%.

A Succession of Early Small Animal Ambulances

All three of the vehicles illustrated were employed by the late Dr. J. C. Flynn, Kansas City small animal specialist, in his practice. These were the butt of many jokes by students of the now extinct Kansas City Veterinary College on 15th Street. Doctor Flynn, whose demise was noted (VETERINARY MEDICINE, June 1954, page 256) poineered the specialty practice with pet animals. He claimed to have established the first exclusive small animal hospital in the world, and the ambulances pictured served to transport injured and ill pets to and from the facility prepared for their care.

The first (top) was a Studebaker Flanders placed in service about 1912. The second (center) was a Ford roadster (1915, without self-startrter) converted to accommodate the cage built for the first vehicle. Bottom picture indicates further advancement of design and was an especially prepared body on a Ford chassis, put into service in the year 1918 (approx.). These preceded a succession of similar vehicles which served a need of the day and assisted in building a practice.

Some Diseases of Cattle Caused by Clostridia

(Continued from page 274)

repeated on the third day.

7. In valuable herds a prophylactic dose of seven-to nine-day type penicillin to exposed animals may prove a good investment.

8. Heavy doses of intravenous or peroral sulfonamides are contraindicated because of the already existent kidney stress.

9. During convalesence a rich ration supplemented by a stepped-up intake of a good mineral mixture carrying iron and copper is indicated.

Summary

The clostridial disease of cattle fall into patterns of geographic distribution but with variance even to individual farms.

Cl. hemolyticum outbreaks may occur in non-red water areas among shipped-in cattle weeks or months after arrival.

"False blackleg" may be caused by *Cl. novyi* as well as *Cl. septicum* and vaccination with *Cl. novyi* bacterin controlled losses.

A type of summer red water among young cattle drinking stale pond water appears due to *Cl. perfringens*, Leptospira or a dual infection of both.

The treatment of acute hemolytic anaerobe infections include care in restraint, whole blood, cardiac stimulants, ACTH or cortisone and iron-copper supplements during convalesence.

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Chymotrypsin Treatment of Chronic Infection

(Continued from page 270)

It appears, therefore, that the selective activity of the proteolytic enzymes for digestion of necrotic material represents a great step forward in medical research and provides an answer to long-felt needs.

Summary

Seven cases are reported in which the proteolytic enzyme chymotrypsin was used in the treatment of conditions characterized by the presence of purulent exudate and necrotic tissue. It was found that the enzyme digested and reduced to a liquid state all purulent material, blood clots, fibrin formations, and calcifications, and any other dead tissue present in the lesion. Living cells were not affected. There was found to be a transient rise in temperature in some animals which may have been due to rapid absorption of toxic material prior to thorough drainage. No other untoward effects were noted. Experimentation has shown that the dosage of chymotrypsin required to treat adequately any condition is quantitatively related to the extent of the lesion and the amount of material to be digested. Repeat treatments are indicated in widespread involvement where an excessively heavy exudate is present.

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With the recent grant of $15,000. for continued research on infectious diseases of dogs, contributions of the Gaines Dog Research Center, New York, toward the support of the Veterinary Virus Research Institute at Ithaca, N. Y., now totals $45,000. The most recent contribution was presented by Harry Miller, director of the Center. Studies under conditions made possible by the excellent facilities at Ithaca have been productive.

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Practitioners have not made full use of all information available for the diagnosis of mastitis.

EDITORIAL COMMENTS

Possible Cause of Treatment Failure in Acetonemia

In reference to the report prepared by Dr. G. R. Moore, *et al.*, entitled Displacement of the Bovine Abomasum, that appeared in VETERINARY MEDICINE for February 1954, Dr. D. H. Udall states that, in his opinion, observations of Moore and his associates at Michigan State College constitute one of the most important findings of clinical veterinary medicine that has been published in recent years. He states that the authors have solved the problem of the persistent incurable attack of "acetonemia" which previously has been treated without success by all who have engaged in cattle practice. The sixth revised edition of Doctor Udall's book, The Practice of Veterinary Medicine, is expected to be available soon.

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Immunity Response to Swine Erysipelas Bacterin

Difference in interpretation of reaction to the scratch test appears as the chief discrepancy in evaluation of swine erysipelas bacterin. Dr. R. D. Shuman classifies any animal exhibiting the slightest reddening at the test scratch site as a positive reactor. He considers these nonimmune. He indicated during his address, before the North Central Iowa Association meeting in April, that animals vaccinated with the bacterin develop a degree of immunity affording some protection against development of typical skin lesions.

The feeling also has been expressed by other investigators that, though reactions to challenge are apparent, they are generally mild, and that sufficient immunity is induced by bacterin to be practical from a clinical standpoint; which is to say that vaccinated swine would be protected against likely field exposure.

Just what constitues an immune animal needs to be standardized. This can be expected only after many things not now known about erysipelas are proved by research. One must avoid hasty conclusion since there exists the possibility that swine, exposed to live culture, may remain as carriers and shedders of infective microorganisms.

QUESTION BOX

What type of lesion may be expected to respond favorably to proteolytic enzymes? See page 265.

? ? ?

What diseases of cattle must be differentiated when hemoglobinuria is a symptom? See page 271.

? ? ?

What are the methods by which calves may become infected with ringworm? See page 275.

? ? ?

What chemotherapeutic agents are satisfactory for sedation in dogs? See page 281.

? ? ?

What theory of urinary calculi formation suggests the use of hyaluronidase as a preventive? See page 289.

? ? ?

What possible anomaly may be responsible for persistent, incurable attacks of acetonemia? See page 298.

? ? ?

What three practices can be relied upon to protect swine against losses due to internal parasites? See page 303.

? ? ?

Virus Mutants

The concluding paragraph of a discussion headed, Better Polio Vaccine (*S. N. L.*, May 8, 1954) is quoted as follows: "Some scientists, however, feel there is always the danger that the harmless mutants would mutate back to a virulent form of virus, and that the attenuated or weakened ones, also would become virulent again."

In this connection, it is interesting to note that some qualified specialists in the hog cholera field find that a few pigs, in a few herds, may have developed chronic hog cholera possibly as a result of mutation of the new, so-called foreign-tissue-adapted, hog cholera vaccines.

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Dr. R. H. Leonard, Muskogee, Oklahoma, states that diagnostic service to the poultry industry, without dispensing agents for treatment, is the basis of his successful and extensive poultry practice.

Brucellosis Eradication Campaign

The annual meeting of the National Brucellosis Committee (affiliated with Livestock Conservation, Inc.) met in Chicago last month to report progress of federal and state control officials and lay plans for the coming year.

Dr. C. D. Van Houweling, director of Livestock Regulatory Programs, USDA, stated that regulations are being revised to develop the most sensible approach to a workable interstate program. The need for uniform procedures for an effective program was stressed.

Mr. W. E. Winn, president, Pure Milk Association of Chicago, spoke of the dilemma among dairy farmers supplying fluid milk in those consuming areas that have adopted the new Sanitary Code. "Many Grade A producers," said Mr. Winn, "have tried to clean their herds of infection at heavy expense, only to be reinfected by neighbors who did not join the control program. These want no part of any half-way measures. They demand that if this program is continued, it should eventually, and without delay, include all livestock subject to the disease."

Dr. A. K. Kuttler, Animal Disease Eradication Branch, USDA, remarked that in 1953 more cattle were tested than in any calendar year since 1939. He also stated that calfhood vaccination reached an all-time high. Over 1,000,000 cattle were blood tested during 1953 and the present rate of the ABR test is over 1,000,000 per month. Recent national tests indicate that over 3% of all cattle are infected. Infection is present in 1 to 3% of all swine herds in the country.

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It would be a fitting conundrum for those who would eradicate a given disease from the face of the earth for all time, with some new super-vaccine or serum, to list all diseases eliminated from this planet by any method in any age. These optimists supreme might end their days so employed, seeking the first name with which to begin their list.

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Irrigation of the uterus with solutions containing streptomycin has proved effective in the treatment of vibriosis in cows.—*L. E. McDonald, D.V.M.*

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The average person ate 75 lb. of beef in 1953, setting a new consumption record in the United States. —*S. N. L.*

Revised A.S.P. Public Relations Campaign

A new, powerful series of advertisements telling farmers why they should have pigs vaccinated against cholera, and especially urging the importance of having the vaccinating done by their veterinarian, is now being released to more than 11 leading farm magazines by Associated Serum Producers.

The series appears over the name of the American Foundation for Animal Health—educational bureau of Associated Serum Producers. Stressing the ever-present threat of cholera and the need for scientific judgment in determining the type of vaccinating to be done, the series of advertisements includes such headlines as: How Not to Fight Cholera; What's a Dying Hog Worth?; World's Greatest Pig Thief; and, Cholera is Ready—Are You?.

Typical of one of the advertisements, and its strong urge for the farmers to depend on his veterinarian for vaccination is the following:

How Not to Fight Cholera

Sure—you can let your spring pigs go unvaccinated. But that would be their death sentence, if cholera should strike your farm.

Proper vaccination against cholera involves many angles. It is much more complex than simply injecting something under the skin. Mistakes as to WHEN to vaccinate, the TYPE of vaccination to use, or the METHOD, can be very costly.

From any standpoint, you run too many chances when you gamble with cholera, or with amateur methods. Have EVERY pig vaccinated. It's their only protection. But, above all, have the vaccinating done by a VETERINARIAN. He knows both how and when to vaccinate to assure safety; and he knows which kind of vaccination is best for YOUR pigs. Call your veterinarian and be really safe.

This message in the public interest is sponsored by American Foundation for Animal Health.

Advertisements run from March through June. They will again resume in the same farm publications in September and October, to warn farmers of the dangers of fall outbreaks and the importance of fall vaccination if it has not been done earlier.

Sixteen companies, members of the Associated Serum Producers, are underwriting the cost of this campaign as well as other projects through the media of daily newspapers and radio.

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In England the Dachshund is sometimes spoken of as the dog with the Queen Anne legs.—*Gaines Dog Research Center.*

Antibiotic Therapy

Though there are at least 41 different antibiotic dosage forms for use in animal medicine, the secret of successful use lies in achieving a sufficient concentration of the drug in at least one of five body fluids, according to Dr. G. E. Hawley, research specialist on the staff of the Pfizer Experimental Farm, Terre Haute, Ind.

The fluids, the dosage, and the routes by which the drugs are given were named and described before the Western Michigan Veterinary Association on February 18, 1954.

The fluids are: (1) Blood, (2) lymph, (3) cerebro-spinal fluid, (4) urine, and (5) feces.

The routes, with the dosage forms suitable for each are:

1. Per orum. Capsules, pills, tablets, high-level feeds, drinking water medicaments, drenches, boluses, oral sprays, *et cetera.*

2. Per rectum. Capsules, enemas, suppositories, *et cetera.*

3. Inhalants. Puffer dusts, nasal vapors, nasal insufflators for capsule inhalants, volatile oils such as Vicks vatronol.

4. Intranasal. Sprays, puffers, dusts, waxes, greases, salves, *et cetera,* rubbed or smeared on, or in, the nose.

5. Ophthalmic. Eye implants, eye ointments, drops, jellies, washes, *et cetera.*

6. Intravenous. By needle, directly into the vein.

7. Intraperitoneal. By this method the injectable material is placed around the outside of the bowels. The mesentery, or bowel coverings, are capable of absorbing drugs.

8. Intramuscular. By hypodermic syringe, using a long needle thrust into red muscle.

9. Subcutaneously. Just beneath the skin. The material is absorbed quite rapidly.

10. Intrapleural. Between visceral and thoracic pleura.

11. Intrathoracic. Into the thorax.

12. Vaginal. Capsules, douches, sprays, powders, suppositories, *et cetera.*

13. Uterine. Deposited through the cervix into the uterus proper, such materials as douches, sprays, powders, waxes, jellies, *et cetera.*

14. Intracaudal. Into the spinal fluid, by injection between the vertebrae.

15. Topical. Applied directly, such as dusting, spraying or sprinkling an antiseptic on a wound surface.

Doctor Hawley cautioned his listeners to get a healthy understanding of the words—supportive treatment. Know when additional therapeutic agents should be used in conjunction with various dosage forms. Instigate treatment early in the course of the disease. Be certain of the diagnosis and double check your diagnosis against the bacterial spectrum of the antibiotic being used.

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Effects of Environmental Temperatures on Animals

Much has been learned about the effects of environmental temperature on domestic animals at the Animal Psychroenergetic Laboratory, Columbia, Mo. These experiments, conducted in air conditioned rooms, reveal that cattle, hogs, and poultry respond most favorably when outside temperatures are around 65 F. In warm to hot weather conditions, beginning at about 75 F., all animals have difficulty in keeping cool, appetities lag, and production efficiencies decrease. Tolerance to high temperatures is a breed characteristic. Some breeds are less affected than others by increased temperatures of the environment.

Cattle are tolerant to cool or cold weather, whereas swine are most sensitive to it. At 40 F. swine grow only one-half as fast and require about twice as much feed per pound of gain as at 60 F.

Several valuable bulletins on the subject have been prepared by the staff of the Missouri Agricultural Experiment Station, Columbia, a number of which are available to those interested in studying the problem.

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Field Test for Prussic Acid

If hydrocyanic acid poisoning is suspected in cattle, pass the stomach tube and obtain liquid rumen contents.

Place a drop of reagent, prepared by adding 5 gm. of sodium bicarbonate and 0.5 gm. picric acid to 100 cc. distilled water, on blotter or filter paper and touch with a drop of paunch fluid. A color change from yellow to red indicates presence of cyanide, and if such change occurs rapidly (less than ten minutes), a fatal dose is probably present.—*C. R. Cole, D.V.M., Ohio Year Book, 1947.*

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Nyphomania in cows is probably of congenital origin.

A.V.M.A. 91st Annual Convention Seattle, Washington, Aug. 23-26, 1954

Brig. Gen. James A. McCallam
President A.V.M.A.

Brig. Gen. James A. McCallam, president, will preside at the 91st annual convention of the American Veterinary Medical Association in Seattle, Wash., August 23-26, 1954. He will be succeeded at the conclusion of sessions there by Dr. A. H. Quin, Kansas City, Mo., now serving as president-elect.

It is expected that this meeting may set another attendance record. This will be the first time in A.V.M.A. history that a regular annual meeting has been held in this year's host city, and the first time since 1925 that the Pacific Northwest has been so honored. Portland, Ore. was the site of the 1925 meeting, presided over by Dr. L. A. Merrilat, then president. He was succeeded by the late Dr. John W. Adams, of Pennsylvania.

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American Animal Hospital Association Meeting

A total of 790 persons, of which 475 were veterinarians, coming from thirty-eight states, Canada, Puerto Rico, and Cuba, registered at Hotel Statler, New York, for the 21st annual meeting of the American Animal Hospital Association, May 5th to 8th. A three-day program of literary sessions was presented, highlighted by televised clinical demonstrations, sponsored by Pitman-Moore Company and Radio Corporation of America.

The following officers and board members were installed for the year of 1954-55. President, Dr. Charles W. Bower, Topeka, Kan.; President-Elect, Dr. William F. Irwin, Tulsa, Okla.; Vice President, Dr. James H. Yarborough, Miami, Fla.; Treasurer, Dr. Arthur R. Theobald, Cincinnati, Ohio; Dr. Wayne Riser, Skokie, Ill., Executive Secretary.

Twenty-two small animal hospitals were accepted into active membership at the meeting. A committee was appointed by the president to consider the establishment of a memorial fund for research in honor of the memory of the late Dr. Louis A. LaFond, Detroit, Mich., who, until his death last February, served for many years as the Association's Hospital Inspector.

A semi-annual business meeting of the A.A.H.A. will be held following luncheon at the Olympic Hotel, Seattle, Wash., on Monday, August 23, in conjunction with the A.V.M.A. meeting in that city. The 1955 annual meeting of the A.A.H.A. will be held at Hotel Statler, Detroit, Mich., May 4th to 7th.

Moss Essay Contest Winners

Writing on the subject of, My Professional Responsibility to My Colleagues, My Clients and My Patients, Sanford M. Schor, a June graduate of Oklahoma A. and M. College, won the Grand Prize in the Moss Essay Contest, which is sponsored yearly by the A.A.H.A. In winning this honor, Doctor Schor received an all-expense paid trip to the annual meeting of the Association at Hotel Statler, May 5th to 8th, and read his prize winning essay before the convention.

Reserve Grand Prize in the contest went to another outstanding June graduate, Jordan Robert Dann, of Colorado A. and M. College. Doctor Dann also attended the New York meeting and was introduced to the convention. Further indication of Doctor Dann's professional ability is shown by the fact that, following graduation this year from Colorado A. and M., he was accepted for internship at Angell Memorial Hospital at Boston.

The Moss Essay Contest was originated several years ago by Dr. Lloyd C. Moss, who conceived the idea of a contest among veterinary students to promote thought on the principles of veterinary ethics. Through the American Animal Hospital Association, he financed the contest on the subject of ethics, and the idea proved so worthwhile that this group saw fit to continue it as an annual project in the veterinary schools.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

Leptospirosis Symposium Summarizes Known Facts

Leptospirosis (Weil's disease in man, Stuttgart disease in dogs) occurs as a spirochetal infection in man, cattle, dogs, horses, and swine. In cattle, infection is characterized by fever, anemia, jaundice, and hemoglobrinuria This disease is receiving increased attention from public health officials and research workers, primarily because it is a human health menace, and secondarily, because it is an economic problem in meat food production. A symposium on leptospirosis held December 11 and 12, 1953, under the auspices of the Army Medical Service Graduate School at the Walter Reed Army Medical Center, participated in by physicians, veterinarians, and others, brought out, among other facts, the following:

1. The disease in cattle—to a lesser extent in dogs, and still less in swine and horses—will be found extensively.

2. Leptospirosis in livestock should be made a reportable disease.

3. Treatment is most effective in the early stages of the infection by means of immune serum and antibiotics, and is of questionable value in cases that have advanced to the stage of irreversible renal lesions.

4. Some of the symptoms in cattle are fever, anorexia, depression, diarrhea, anemia, icterus, hemoglobinuria and hemoglobinemia, thick yellowish milk and agalactia, weight loss, and abortion. Not all of these symptoms are clinically evident in all cases.

5. From the standpoint of differential diagnosis, the diagnostician should bear in mind symptoms of Bracken fern poisoning, sweet clover poisoning, poisoning following ingestion of trichlorethylene extracted soy bean meal, anaplasmosis, brucellosis, vibriosis, malnutrition, parasitism, and others. A laboratory confirmation is necessary when outbreaks are not clear cut clinically.

6. Under ordinary circumstances a recovered patient is immune. An essayist states, "Our studies of agglutination and lysis reactions have confirmed the suspicion that the antibiotics, if used early, interfere with the processes of immunization . . . . it is important to realize that if treatment is begun on the first, second, or even the third day, antibody formation may be insignificant or nonexistent."

7. "Early treatment with aureomycin®[1] or terramycin®[2] in oral doses of 500 mg. four times daily for four to six days is the best specific therapy now available for leptospiral infections. If administered after the fifth day, however, these antibiotics are no longer capable of modifying the course of such infections but are still indicated for the prevention of late complications."

Since the spirochete is eliminated in the urine of infected animals, segregation of those carrying the infection is imperative. Spattered urine may make the infection air-borne. Contamination of human foods by the urine of rats and dogs carrying the infection is probably the most important means of spread to man.

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Entropion in Lambs

Littlejohn (*Veterinary Record*, Apr. 10, 1954) contends that if the handling of entropion in lambs is instituted within an hour or two after birth, relief is frequent and surgery unnecessary. Method recommended is instillation into the conjunctival sac of local anesthetic to suspend sensation and the manipulation of offending lid outward, sometimes several times in quick succession. Re-examination is advised two or three hours later. The author states that entropion is not inherited as a smiple Mendelian recessive; it has hereditary tendency.

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Malignant Catarrhal Fever

Animals rarely recover from an attack of malignant catarrhal fever, and those that do develop an immunity of from four to eight months duration. Older animals appear to be relatively resistant. Attempted vaccination, or attempts to produce an immunity following vaccination, have not been encouraging, since immunity so produced is of short duration.

®[1]Lederle Laboratory Division, Pearl River, N. Y.
®[2]Chas. Pfizer & Co., Brooklyn, N. Y.

VETERINARY PARASITOLOGY

A. O. FOSTER, B.A., M.A., Sc.D.
Beltsville, Maryland

Swine Helminthiasis

In notable respects, swine helminthiasis is unique and especially challenging. Unlike the situation in any other class of livestock, the losses attributable to parasites of swine are due almost wholly to helminthic species. No comparable loss is ascribable to either the protozoan infections, namely, coccidiosis and balantidiasis, or the arthropod pests, namely, lice and sarcoptic mange mites. The helminthic parasites of swine, moreover, despite their abundance and wide distribution, are fewer in kind than those affecting any other class of domestic animals. There are only some 18 species that are of more or less economic importance; every other class of livestock is plagued by more than twice this number.

The anthelmintic picture in swine is characterized by a paucity of drugs; the seven or so treatments that may reasonably be employed or recommended against worm parasites of this host are notably fewer than those available for use in other classes of animals. At least four times as many anthelmintics are available for use in dogs. Problems of treatment and control are also especially complicated by certain parasites such as kidney worms, lungworms, larval tapeworms, thornheaded worms, trichinea, threadworms and whipworms which, by their location and nature, seem shielded from all easy approaches, but which almost certainly will be conquered eventually by some direct or indirect chemical attack. Finally, the helminthic infections of swine are more important economically than those of any other class of livestock. The loss in swine has been estimated at more than $200,000,000. annually in the United States, which probably exceeds, by a healthy margin, the losses that result from helminthic infections in any other animal.

Because of the hidden effects of helminths, their full economic significance is rarely appreciated. When pigs appear to be doing well, it is too often felt that the presence of a few parasites is of minor concern. This complacency is costly. One adult ascarid may depress the rate of gain by more than 1 lb. before pigs reach five months of age. As many pigs may be marketed from two "sanitary" litters as from three "unsanitary" litters, and the latter may require four months longer to reach market weight. The loss from condemnations under federal meat inspection, chiefly because of kidney worms, may amount to $50. per 100 pigs in some areas. A recent study showed that Strongyloides, the intestinal threadworm, could largely nullify the capacity of pigs to grow, as well as cause morbidity and mortality losses.

Chief reliance for protection from losses due to these parasites must be placed on sanitary rearing, special dietary management, and judicious effective medication. Most swine parasites can be controlled by a system of sanitation which encompasses the following main features: (1) Clean farrowing pens, (2) sows washed clean before farrowing, (3) a "clean" trip to clean pastures for the sows and their litters, and (4) clean pastures for the pigs until they are four months of age.

Many parasites can be controlled by feeding pigs exclusively on milk, skimmed milk, or whey for periods of three successive days at intervals of two weeks, or by feeding one or another of those daily in lieu of one grain feeding.

Medication is exceptionally efficacious for the control of large roundworms, and the use of an efficient treatment against them is almost always a necessary adjunct to the successful control of swine parasites. The most effective treatment consists in the administration of sodium fluoride (technical grade, tinted) at a concentration of 1% by weight of dry, ground feed for a period of one day. Pigs should be slightly underfed the day before treatment, but not fasted. On the day of treatment they should be given about two-thirds the amount of medicated feed that they normally consume of regular feed. Market pigs should be treated after weaning and again about two months later. *Sodium fluoride is poisonous*, however, and containers should be labeled conspicuously and stored out of reach of children.

Sodium fluoride also has good action against stomach worms (Ascarops) and some action on nodular worms. Against the latter, however, phenothiazine is more effective. It is not possible to comment on the comparative

(Continued on page 307)

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
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Pathogenesis of Histomoniasis of Turkeys

Harrison, *et al.*, (*Poultry Sci.* 33:84, 1954) in a report on research conducted at the University of Maryland, have added a valuable contribution to the literature on pathogenesis of histomoniasis (infectious hepatitis, blackhead). Especially important are their observations that *Histomonas meleagridis* often exists in typical liver abscesses uncontaminated with other microorganisms (bacteria, viruses, and other Protozoa), and that pure cultures of the parasite are capable of producing the typical disease. Association of the other microorganisms in the livers, in cases encountered by them, did not seem to influence the nature of the disease. A good review of the literature with an accompanying bibliography is included.

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Furazolidone as a Treatment of Fowl Typhoid

Grumbles, *et al*, of the School of Veterinary Medicine, Texas A&M College, have found that furazolidone (5-nitro-2-furfurylidene)-3-2-oxazolidine) given in feed to turkeys suffering from experimentally produced fowl typhoid will prevent mortality effectively.

Unfortunately, the drug will not eliminate carriers among survivors and recurrence of the disease may occur when treatment is discontinued. The drug appears to have value, however, for reducing mortality in outbreaks if given at the onset of symptoms and before appetite has been retarded. Flocks that recover should not be kept for breeders because of the failure of the drug to eliminate carriers.

Grumbles and his associates found that 0.01% of furazolidone mixed in the feed and given either before exposure, at the time of exposure, or three days after exposure, prevented losses from fowl typhoid. The drug is insoluble, so must be given either in capsules or in the feed. Sick birds that do not eat will not benefit necessarily from the medicated mash. A limited number of sick birds were treated successfully by giving a 100 mg. capsule. No evidence of toxicity was observed.

In the same experiment, the investigators found that sick birds given feed containing 0.033% of sulfaquinoxaline three to five days after exposure had no effect on the course of the disease. Chickens were not used in any of these experiments.

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A news release in graphic form recently issued by the Bureau of Agriculture Economics is entitled, America's Eating Habits are Changing. Of interest to the poultry industry is the fact that, of the foods listed, poultry products were the only ones that made substantial gains in consumption from 1935 to 1953. Turkey meat lead with a 115% increase; chicken meat was up 65%, and 36% more eggs were being consumed in 1953.

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As a result of recent research by the University of Maryland Poultry Department, poultrymen are being advised that pullets and cockerels to be kept for breeding flocks should not be treated with estrogens. Implanting female sex hormones in such birds permanently impairs future reproductive capacity. The effect is somewhat more harmful to the male than to the female (Shaffner, *The Poultryman*, March 27, 1953, p. 3).

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The use of the standard white candling lamp will not detect so-called sour eggs caused by contamination with a species of the bacterial genus Pseudomonas. Under a black light, these sour eggs fluoresce a green color. A new candling machine, sold under the trade name Vogelite, combines both white and black light and makes it possible to detect in one operation all types of defective eggs under normal candling room conditions.

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Two new books of interest are, Practical Poultry Breeding by Dr. Don C. Warren, National Coordinator, Regional Breeding Projects, Purdue University, and Avian Physiology by Dr. Paul D. Sturkie, Professor of Poultry Physiology, Rutgers University. The former is published by The Macmillian Co., New York, and the latter by Comstock Publishing Associates, Ithaca, N. Y.

Bovine Eperythrozoonosis

K. W. CROCKER,* D.V.M., and
M. D. SUTTER,** D.V.M.

Thirty-five bred Hereford heifers were shipped from Texas to Kentucky in October, 1952. All the heifers were in poor condition, and began calving shortly after arrival. Several cases of dystocia and retained placenta were treated as was one case of prolapsed uterus. Two of the heifers and seven calves died during, or shortly after, parturition. No abortions were reported.

During the following year the condition of the herd was unsatisfactory for the condition of pasture. Emaciation of cows and calves was the rule. The following problems and cases were encountered during this year: (1) Several cases of diarrhea were observed in the calves, (2) rundown condition throughout the herd, (3) intermittant diarrhea in cows and calves; treated with phenothiazine for worms.

In August 1953, even though the remaining heifers and calves had been running on good pasture of Kentucky 31 fescue, orchard grass, and lespedeza, all were sluggish, listless, had poor appetites, exhibited either anemia or icterus and resultant decrease in milk flow. Calves were stunted. Intermittent diarrhea was a constant problem and nothing was effective in relieving this symptom. However, clinical manifestations varied from none to severe.

Autopsy of one cow revealed emaciation and anemia and a slight generalized icterus. The remaining postmortem features appeared essentially normal. Six blood smears were sent to a commercial laboratory for diagnosis. At the laboratory, ringed bodies on one of the slides appeared to resemble Eperythrozoon bodies, but to substantiate this seemingly abnormal finding, the slide was sent to Dr. E. J. Splitter, Kansas State College, Manhattan, who confirmed the tentative diagnosis and classified the organism as *Eperythrozoon wenyoni*, with no evidence of anaplasma bodies. Further laboratory findings revealed anemia, plus an eosinophilia. One differential count showed 33% eosinophiles.

Doctor Splitter also stated that he believed "This is the heaviest parasitic invasion I have

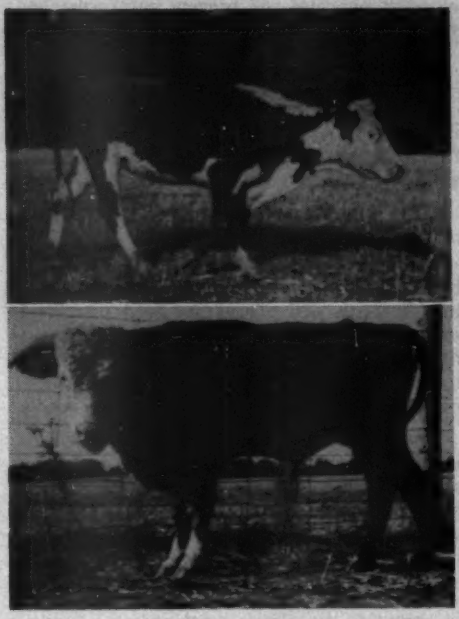
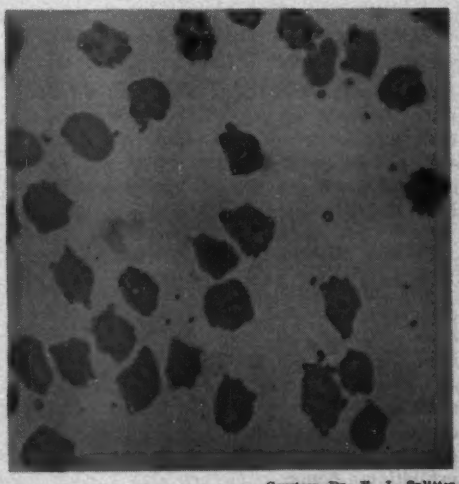


Fig. 1. Illustrating emaciation and general unthriftiness due to blood parasite infection.



Courtesy Dr. E. J. Splitter

Eperythrozoon suis. E. wenyonii, the species infecting cattle is similar in morphology to the parasite infecting swine. It is slightly smaller, has less chromatin in the ring and consequently does not photograph as clearly. In relation to erythrocytes, both are extracellular as illustrated.

*Franklin, Ky
**Jensen-Salsbery Laboratories, Kansas City, Mo.

seen in non-splenectomized cattle".

Treatment. Neoarsphenanine, 15 mg. per kg., single intravenous dose, will clear the blood of parasites and prevent any further development of the disease.

Discussion

A heretofore unrecognized disease in cattle is reported. As far as is known, this is the first field case of eperythrozoonosis reported in cattle.

At present, there are several suspected herds in the same area.

Neoarsphenanine has not been tried on this herd as the owner was rather skeptical about the diagnosis and placed the herd under the supervision of another veterinarian. This practitioner retreated with phenothiazine and tematol® with no response. Autopsy findings on one bull were negative except for worms.

Recent correspondence with Doctor Splitter indicates that the Eperythrozoon bodies demonstrate a periodicity; being numerous in the blood stream in preclinical and early clinical stages.

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Acute Lungworm Infestation (Cattle): A Case Report

J. L. ROUNTREE,* D.V.M., J. F. WITTER,* D.V.M., and H. L. CHUTE,* D.V.M., M.S.C.
Orono, Maine

Lungworm infestations are observed commonly in many areas of the world but are seldom associated with an acute syndrome in adult and yearling cattle. This case report deals with such an explosive outbreak observed in a large dairy herd.

History and Diagnosis

Late in August, a bred yearling heifer in emaciated condition, displaying a deep pulmonary cough, was submitted to the Animal Pathology Laboratory. This animal was from a herd of 18 calves, 15 bred heifers and 35 adult animals, predominantly Jersey. The 18 calves, continously stabled behind the milking cows were the only animals in the herd not exhibiting a cough.

The 15 bred heifers, due to calve in October and November, had been acquired in two lots during the middle and latter part of May. One of these displayed a slight cough and was not in good flesh when purchased. Dry weather necessitated grazing these heifers with the adult animals during the last of June and early July. About July 1, one adult animal developed a cough, followed in a week by similar symptoms in four more of the adult animals. The heifers on pasture were checked by

Fig. 1.

the owner at this time and all were coughing. Within a few days the remainder of the adult animals exhibited symptoms.

Autopsy of a heifer and examination of a lung specimen from an adult animal subsequently submitted, revealed numerous adult lungworms in the bronchi, caseous nodules throughout the lung; pneumonia, and pulmonary emphysema. Cultural and animal inoculation procedures to isolate additional causative agents were unsuccessful. Histopathological studies revealed larval forms in the caseous nodules (figure 1) and terminal bonnchi (figure 2). Three of eight fecal samples from animals showing symptoms were positive for larvae. The zinc sulfate (sp.g. 1.18) flotation method was used to recover larvae from the fecal samples. Identifications of the lungworms as *Dictyocaulus viviparus* was made by J. T. Lucker, Zoological Division, Agriculture Research Center, Beltsville, Maryland.

The losses from this lungworm infestation were heavy. Actual symptoms in individuals were prominant from two or four months. Two heifers and six adult animals, all Jersey, were slaughtered *in extremis.* Four of the slaughtered animals were suffering concurrently from chronic mastitis. The few Holsteins in the herd seemed to resist the effects of the infestation better than the smaller Jerseys and those in advanced pregnancy. Cough-

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®Pitman-Moore Co., Indianapolis, Ind.

ing abated during the first week in September, followed by a slow convalescence. Clinical recovery was not complete in a few animals until December.

Control and Treatment

Phenothiazine fed continuously in small doses was suggested to reduce recontamination of pastures. However, changing to a clean pasture with good forage cover also was recommended. Anti-bacterial treatment was necessary in some animals which displayed a fluctuating temperature, probably due to secondary bacterial infections[1].

Discussion

The prepatent period of *D. viviparus* is at least three weeks,[2,3] yet the first adult animal displayed symptoms only two weeks following cohabitation with the heifers. The purchased

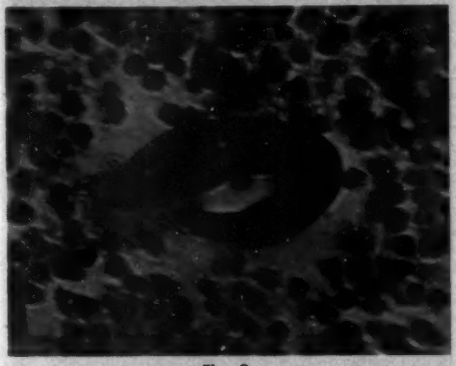

Fig. 2.

animals may have been the source of infestation, however, white tailed deer *Odocoileus virginianus* also are known lungworm hosts,[4,5,6] and were common to all pastures on this farm. Deer are commonly infested with lungworms in this area, according to the observations of Witter,[7] and should be considered a possible factor in the heavy pasture contamination associated with this case[8].

Dry weather and overgrazing resulted in short pasture which would tend to increase the severity of the exposure inasmuch as only a slight negative geotropism is shown by the infective larvae[8,9].

Treatments other than supportive and symptomatic have not proved benificial[8,9]. Emetine hydrocholoride, effective in certain sheep and goat lungworm infestations, has no effect against *Dictyocaulus sp.*[9].

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Swine Helminthiasis

(*Continued from page 303*)

merits of sodium fluoride and cadmium oxide as ascaricides, but it is hoped that this situation will be studied shortly. The other anthelmintics that are available for use in swine, namely, carbon disulfide in ascaropsiasis and chenopodium oil, hexylresorcinol and santonin in ascariasis, are poor secondary choices.

It will be noted that no medication can be recommended against some 11 of the 18 comparatively important species. Among those that cannot be treated, in addition to species already named, are gullet worms, red stomach worms, and hookworms.

From this brief account, the conclusion is evident that swine helminthiasis is a particularly challenging field for the development of new and improved anthelmintics and other chemical control measures. Conceivably, the environmental or indirect chemical attack may offer the most immediate promise against some of these infections. It will be recalled that certain polyborates, deltabenzene hexachloride and other larvicides have been suggested for the chemical control of kidney worms.

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The practice of adding sulfonamides to poultry rations for prevention of coccidiosis has set the poultry industry back ten years.—*R. H. Leonard, D.V.M.*

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The average national cost of producing a dozen eggs during 1953 was $0.51.—*Feeding Forum.*

ITEMS OF VETERINARY INTEREST

A cynologist is one who directs his skill toward treating illnesses of dogs.

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Antibiotics are therapeutic agents—not nutrients, as some agricultural sources claim.

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A recent report in the *Jour. Am. Med Assn.*, indicates that benadryl hydrochloride, controls postoperative nausea.

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Midcervical deposition of semen is now favored by those practicing routine artificial insemination of dairy cows.

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Maine veterinarians were advised that the milk ring test costs $0.02 per cow on the average as compared with $0.87 for the usual plate agglutination blood test.

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In discussion on hormone feeding to fattening cattle, Wise Burroughs, *et al.*, state that patents have been applied for on this method of feeding. *Am. Feed Mfr. Assn.*

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Sows and gilts fed an exclusive vegetable diet produce smaller and weaker litters than those fed some animal proteins. This is attributed to a deficiency of cyanocobalamin (vitamin B_{12}) *Vet. Bul.*, Sept. 1953.

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The Associated Press is authority for the statement that three human infants have been born of mothers inseminated with frozen semen. This is the first such report in human medicine.

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The Oklahoma Veterinary Medical Association recently donated $500. to the establishment of the McElroy Library on the campus of the School of Veterinary Medicine, Oklahoma A. and M. College, Stillwater. Dr. R. A. Todd, Tulsa, is president of the state association.

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Investigations in Berne, Switzerland, give support to the theory that equine periodic ophthalmia in horses is due to Leptospira infection. Significant agglutination titers are found in the aqueous humor of horses during initial acute stages of disease, and in greater intensity during relapses.

Cutaneous Ancylostomiasis

CHARLES T. BUSH,* Capt., U.S.A.F. (VC)

Although veterinarians confine their practice strictly to animals they should be acquainted with animal diseases contagious to man. Concerning such diseases they are interested in human pathology and epidemiology. With such a knowledge, the veterinarian's service to mankind will go well beyond the animal element.

The accompanying photograph depicts a case

of cutaneous ancylostomiasis or "creeping eruption" affecting a seven-year-old southeastern Florida boy, may be of interest, especially to those who practice in northern areas.

The larva, possibly *Ancylostoma braziliense*, started at the commissure of the lips and slowly burrowed across the face. In a 14-day period it migrated slightly over one inch. Frequent movement caused intense pruritus.

Secondary bacterial infection, possibly staphylococcus, carried in by the larva, broke through the skin at several places forming pustules.

The case responded to treatment by a local physician, consisting of freezing with ethyl chloride and parenteral penicillin (300,000 units intramuscularly).

*Tyndall A.F.B., Panama City, Florida.